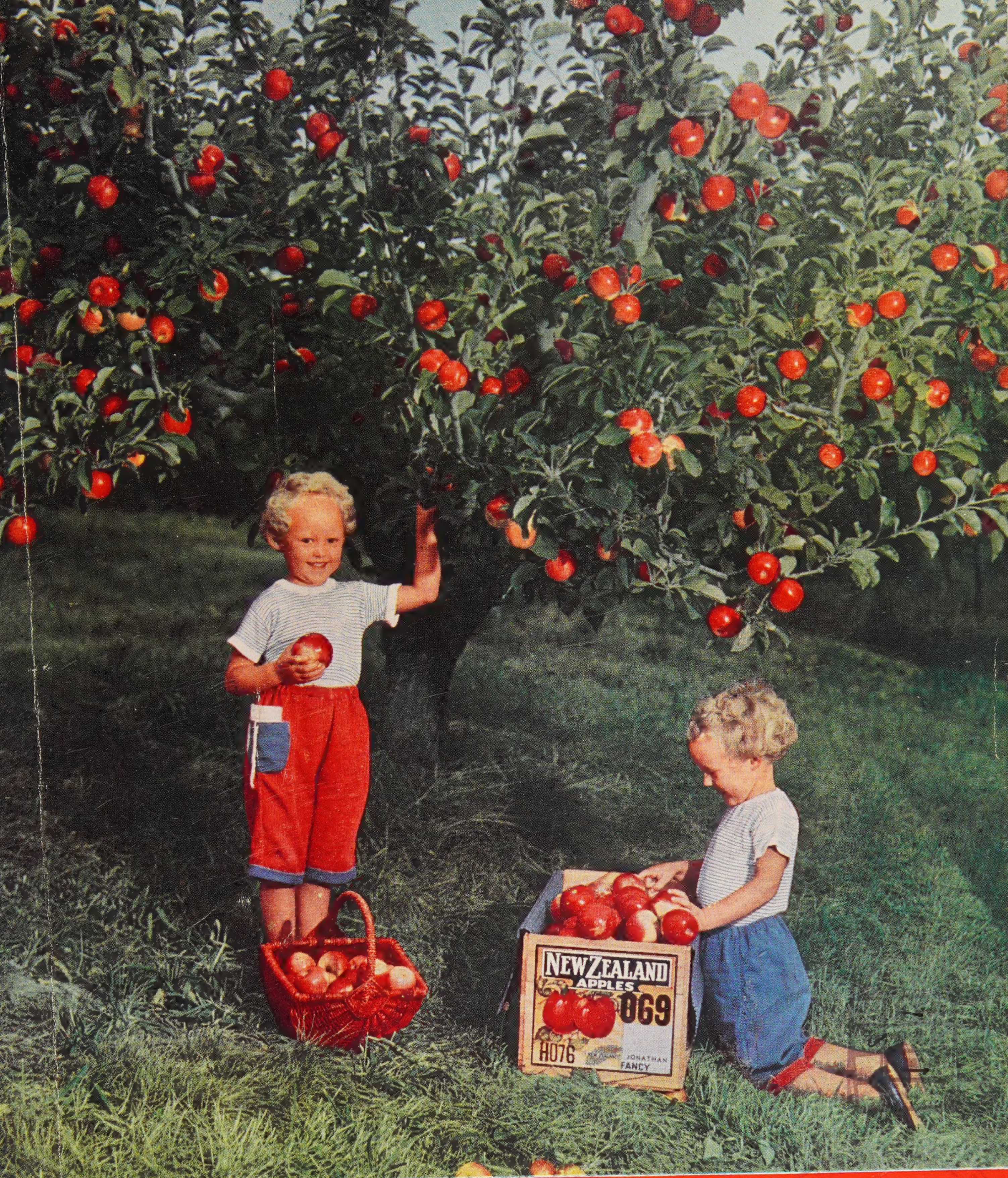

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Cover

Two robust young New Zealanders ready to sample the apple crop in the Appleby Research Orchard, Nelson, one of the four research orchards maintained by the Fruit Research Station of the Department of Scientific and Industrial Research. In the 1960 season Nelson produced 1,550,000 bushels of apples, of which 1,124,000 bushels were exported.

[*Ellis Dudgeon*

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[*Whites Aviation*

GRASSLAND CONFERENCE in BAY of PLENTY

THE middle and middle-eastern parts of the North Island, the soils of which have been built up mainly by material from a series of volcanic eruptions extending up to late last century, have long been a focus of especial interest by grassland workers; first because of the peculiar problems in the establishment and maintenance of pastures on the pumice and ash soils, and subsequently because of the outstanding problem of the wasting disease of livestock that for many years blighted attempts at grassland farming in the area.

AGAINST this background of early and prolonged problems and the subsequent rapid development of grassland farming after the control of "bush sickness" of sheep and cattle became possible by the use of cobalt in fertiliser topdressing, the New Zealand Grassland Association's 23rd annual conference was held at Tauranga in the Bay of Plenty in October.

REMOVAL of the hazard of bush sickness by the discovery of the cobalt cure in 1935 was largely responsible for the increases in the Tauranga County for the 30 years up to the mid 1950s of 50 per cent in the area grassed, 300 per cent in dairy cow numbers, 100 per cent in total cattle, 4,000 per cent in breeding ewes, and 1,800 per cent in total sheep. Carrying capacity in the same period was more than doubled, from 2.2 ewe equivalents to 4.9.

The momentum of this spectacular progress slackened a little during the fertiliser rationing period during and immediately after the Second World War, but in recent years full advantage has been taken of new knowledge and techniques of pasture establishment and management, and papers on the district and visits to four farms during the conference field day showed that the area is now doing at least as well as any other grassland district in the country.

With its great advantages of a subtropical climate on the coast, the Bay of Plenty district offers scope for diversification in the direction of horticultural and vegetable production, and intensive forest resources in the hinterland contribute considerably to the district's prosperity.

Soils

The Bay of Plenty has a wide variety of soils the differences in which are

HEADING ILLUSTRATION — Rolling country near Te Puke on the Bay of Plenty coastal strip; Manoeka Pa at crossroads centre right.

The pattern of ash showers as → they affect soils and farming in the Bay of Plenty. (Data by Soil Bureau.)

important to land use, said Mr H. S. Gibbs, Senior Pedologist, Soil Bureau, Department of Scientific and Industrial Research, in a paper to the conference. The district comprises a triangular area formed by the coastal strip and sloping upward to the Taupo district in which a very active zone of volcanism developed and along which lava, pumice, sand, and dust have been erupted at different times and places to build up a series of lava plateaux covered with volcanic ashes. The soils are derived chiefly from a series of six volcanic showers, the latest of which (Rotomahana and Tarawera) fell in 1886.

Waihi ashes cover older ash deposits that may be seen in deep cuttings in which black and dark brown bands usually indicate buried topsoils developed between ancient eruptions in the district's long history of periodic smotherings.

Soils not derived from deposits of volcanic ash are on river flats, peat swamps, and sand dunes that have accumulated since the latest series of showers, but even on these the soils have been strongly influenced by the ashes, which through erosion have supplied most of the mineral constituents.

At altitudes below 1,000 ft the mild, humid climate is very favourable to the rapid and continuous growth of plants. Rapid formation of soil and circulation of nutrients assist the maintenance of fertility. Moisture limitations on plant growth are not common.

In inland basins and uplands above 1,000 ft the climate is cooler and wetter, rates of mineral and organic decomposition are slower, and intensity of leaching greater; hence the soils are poorer and annual growth of plants less.

Conference "Proceedings"

PAPERS at the Grassland Association Conference additional to those quoted in these pages were:

Some Factors Affecting Production on a Bay of Plenty Dairy Farm: A. Yeoman.

Farm Management Practices as an Aid to Pasture Establishment on Steep Greywacke Hill Country: J. D. Currie.

Pasture Species and Mixtures for the Auckland Province: J. E. Bell.

Pasture Establishment on Swamp Land on a Bay of Plenty Dairy Farm: W. M. Reynolds.

Pasture Establishment on a Reporoa Sheep Farm: G. Carrington.

Modern Trends in Grassland Farming: L. R. Wallace.

Fertility Requirements of Pastures and their Diagnosis: T. W. Walker.

Prairie Grass as a Substitute for Short-rotation Ryegrass: A. W. Pantall.

Management of Winter-wet Soils: B. T. Jordan.

How Various Methods of Wintering Affect Pasture Swards: J. Adam.

Some Effects of Sheep Urine on Pasture: W. R. Dale.

Grass Swards for Airstrips and Playing Areas in the Auckland Province: J. R. Murray.

All papers and summaries of discussion on them are printed in the "Proceedings", copies of which (15s.) may be ordered up to the time of going to press from the Secretary, N.Z. Grassland Assn., Box 2298, Wellington.

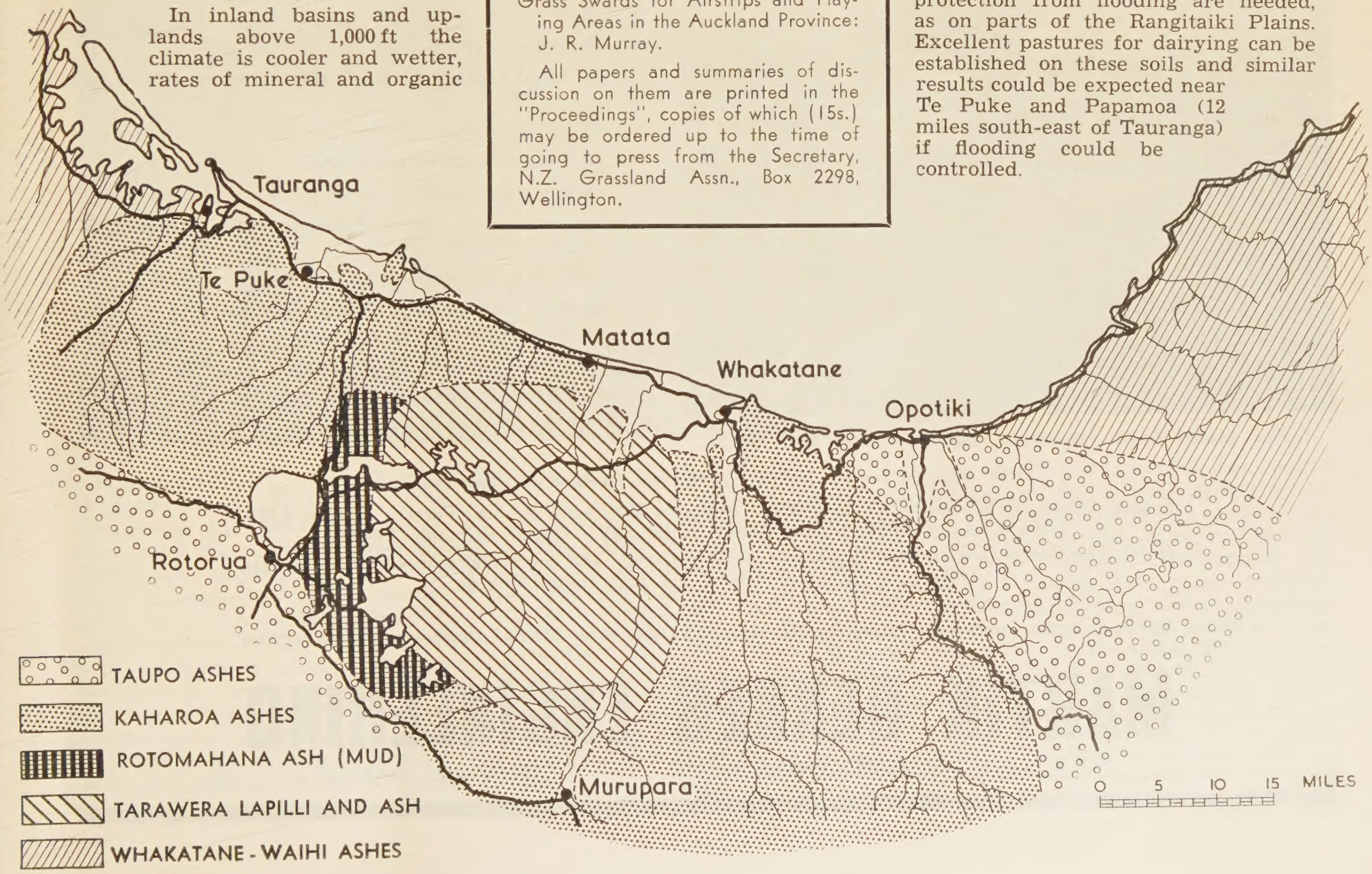
For pastoral farming the less strongly leached members of each suite can be classified together as soils capable of maintaining highly productive pastures. With heavy topdressing the more strongly leached members will also grow high-quality pastures, but their annual productivity is limited by cold, wet winters and the generally cool climate.

All pumice soils and yellow-brown loams of the district drain rapidly, which is a big advantage in the high rainfall.

Soils from the Kaharoa and Taupo ashes are deficient in cobalt, which must be added if healthy grass is to be grown for cattle and sheep.

In pumice soils and yellow brown loams the copper content is enough for pasture growth and animal health, but with liming and the application of molybdic superphosphate the levels of molybdenum in grasses may rise and lead to disorders in stock unless copper is supplied to reduce the molybdenum : copper ratio in pastures.

The peaty soils (dark brown peaty loams) containing shallow layers of volcanic ash from the Tarawera, Kaharoa, and Taupo showers and river alluvium are potentially fertile but need drainage. As these soils occur at or about sea level, pumping and protection from flooding are needed, as on parts of the Rangitaiki Plains. Excellent pastures for dairying can be established on these soils and similar results could be expected near Te Puke and Papamoa (12 miles south-east of Tauranga) if flooding could be controlled.



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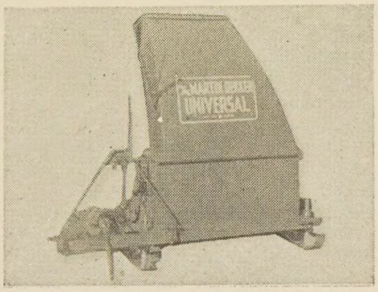

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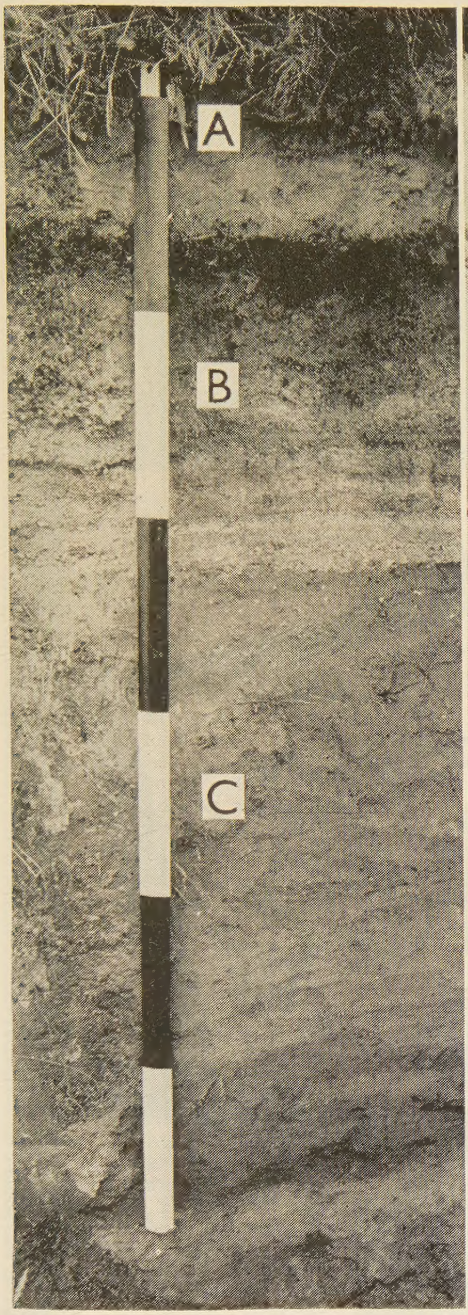

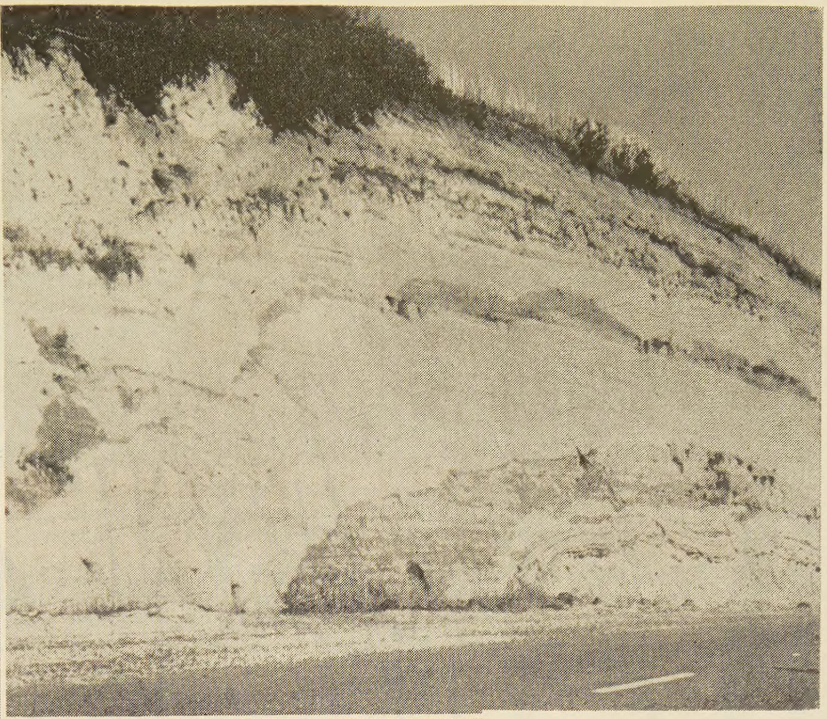

Left—A Bay of Plenty soil profile: A, 0 to 8 in., Rotomahana mud; B, 8 to 27 in., Kaharoa ash; C, 27 in. plus, Whakatane ash.

Above—Ash beds evident in a cutting on the Whakatane-Ohope road. Black and dark brown bands between ash beds indicate buried topsoils developed between ancient eruptions.

Below—Delving into soil history on Mr R. S. A. Mutton's dairy farm near Te Puke, visited during the field day, Mr H. S. Gibbs presents for inspection a sample of the Kaharoa, Whakatane, and Waihi ashes that lie below the pasture.

From a soil point of view the picture as presented by Mr Gibbs is of a district half unsuited to pastoral farming but the balance comprising 400,000 acres of potentially high-quality pastoral land and 680,000 acres of moderate quality pastoral land with a suitable alternative of timber production. Of the land suitable for pastoral use, none is very rich and none very poor. It responds rapidly and well to topdressing and good management, and given the proper treatment it will live up to the name of the Bay of Plenty.

Farming in the Bay

Few areas in New Zealand have expanded since the Second World War to the extent that the Bay of Plenty has, and the future of the area is assured because of its potential to produce such a wide variety of agricultural, horticultural, and forestry products. This was the conclusion drawn in a joint introductory paper to the conference by the district's two Farm Advisory Officers of the Department of Agriculture, Messrs A. V. Allo, Tauranga, and S. R. Hewitt, Whakatane.

In the first land development in the district, on the easier coastal country, no artificial fertiliser was used and the low natural fertility of the soil resulted in rapid pasture deterioration and weed invasion, with only the lower fertility demanding species surviving. In most of the early pastures there was little or no white clover. Just before the First World War a few farmers began to use phosphatic fertilisers, mostly superphosphate, use of which increased rapidly in the 1920's. The consequent immediate improvement in pasture quality was hastened

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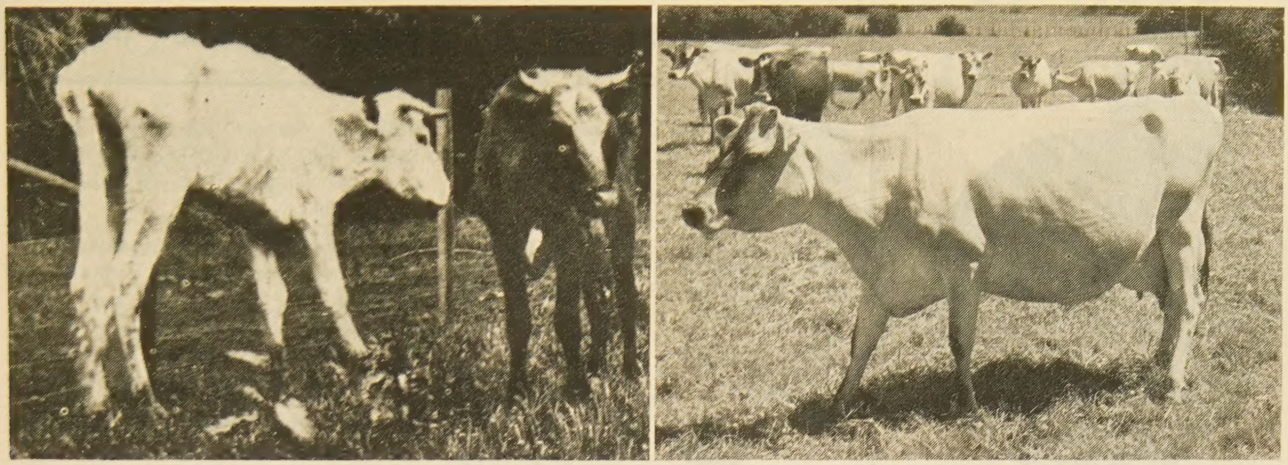

Left—Stock of the pre-cobalt, "bush sick" era before 1935. **Right**—A Tauranga dairy herd typical of the high-producing stock it became possible to carry on the predominantly paspalum, ryegrass, white clover pastures of the Bay after the cobalt deficiency problem had been overcome and adequate fertiliser, mainly superphosphate, was used.

by the introduction of certified pasture seeds in the 1930's.

The introduction of cobalt in the middle 1930's as a remedy for the bush sickness that had always been a problem on soils formed from Kaharoa ash marked the beginning of the renascence of agriculture in the Bay. In 1945 large areas were shown to need potash and since 1950 the increasing use of insecticides to control grass grub and army worm helped to lift pasture production further.

Land Use: Dairying, the dominant farm industry of the district, is centred on the flat or rolling country of the coast, but is also a main source of farm income on many hill farms. Production ranges from 150 lb to 350 lb of butterfat per acre on farms averaging 100 acres and milking 60 to 90 cows.

Sheep farming, of only minor importance before 1940 because of bush sickness, is becoming increasingly important, with store sheep production on the higher country and fat lamb production on the coastal country. The Romney breed is dominant, with increasing interest in the Border Leicester - Romney cross.

On the hillier country many farms too small to be economic sheep units and too broken to be run wholly as dairy farms are running small flocks of from 150 to 400 breeding ewes and milking a small herd.

Citrus and subtropical fruit production occupies about 1,000 acres and there are a number of horticultural and market garden holdings.

The two Farm Advisory Officers of the Department of Agriculture in the Bay of Plenty district, Mr S. R. Hewitt, Whakatane (left), and Mr A. V. Allo, Tauranga (right). They forecast an assured future for the district because of its potential to produce such a wide variety of agricultural, horticultural, and forestry products.

Soil Deficiencies: All the Bay soils are deficient in phosphate, and satisfactory pasture production is impossible without the use of phosphatic fertilisers, the most efficient being superphosphate.

Potash deficiencies develop with land use, particularly on areas cut frequently for hay and on day paddocks on dairy farms.

Departmental trials show no evidence that use of lime or of magnesium as a pasture topdressing is warranted.

As well as the deficiency of cobalt on soils from Kaharoa ash, the peaty loams are copper deficient and there is a suggestion that copper deficiency can be induced by heavy liming of soils from Kaharoa and Waihi ashes. Some of the coastal sand soils have also shown a response to copper in improved stock health.

Soils from Kaharoa and Tarawera ash respond to sulphur dressings, but there seems to be enough sulphur in normal superphosphate topdressings to meet plant requirements.

Molybdenum has not given responses on any Bay soils, and selenium has given liveweight increases in lambs only on the coastal sands.

Boron gives responses with brassica crops on hilly Kaharoa ash soils, but not on pastures.

Pastures: The paspalum, ryegrass, white clover sward dominates coastal country of the Bay and many consider it the ideal pasture for the area. It has a long seasonal production spread and produces up to 400 lb of butterfat per acre. The paspalum provides a wealth of feed when the strains of ryegrass now available produce very little, and by providing ground cover during a dry summer and autumn it helps ryegrasses to survive; but under low fertility or bad management it becomes sod-bound and low producing except in summer and autumn, with no winter and spring production.

Further inland cocksfoot tends to replace paspalum. Cocksfoot will produce feed throughout the year and Messrs Allo and Hewitt consider it should be included in all general-purpose grass seed mixtures on ash country.

Timothy will grow well in the Bay, but there is little of

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it there, as it establishes slowly and contributes very little to the feed supply on most farms.

Prairie grass is coming increasingly into prominence, particularly in the higher-fertility paddocks on dairy farms.

Crested dogstail, common in many hill pastures, provides much useful feed on lower-fertility country.

White clover is the only important permanent clover, with cowgrass an important pioneer on newly developed ash country.

Yorkshire fog produces a considerable amount of winter feed on both swamp and hill country, and the value of fog as a pasture constituent, particularly in relation to stock health, calls for more investigation.

A well consolidated seedbed is needed for successful pasture establishment on volcanic country, and the tendency is to sow on the ash after a burn even though cultivation may be possible with a crawler tractor.

Excellent pastures can be established on virgin country by sowing 20 to 25 lb of seed and sowing 6 or 7 cwt of superphosphate per acre instead of the usual initial 3 cwt. The most efficient land development is being done this way.

Clover dominance of pastures the second year after establishment is common, but can be countered by insect pest control, less lenient grazing in the first few months, adequate topdressing, and lower proportions of ryegrass in the mixture.

→ **Left**—Mr J. W. Woodcock, outgoing president, who emphasised the need for more district research work by farm advisory officers to see how research findings fit their local conditions. **Right**—Mr I. L. Elliott, president-elect, who has made a special study of peat and who has questioned whether peat areas in New Zealand, including those in the eastern Bay of Plenty, might be better reserved for eventual horticultural production.

With summer and autumn dry spells fairly common, overstocking can be a danger.

The present 491,000 acres of grassland is expected by 1980 to reach 620,000 acres, the greater proportion of the increase being used for sheep farming. With the prospect of the establishment of a meatworks in the district in the next 20 years, cattle fattening and fat lamb production will probably increase considerably.

There has been some diversion of farm land to fruit and horticultural production on smaller holdings, and the comparative economics of grassland farming and horticulture will determine the extent to which this will continue.

Increase in dairy cow numbers is likely to come from the use of improved techniques on existing farms, with a distinct possibility of a swing from dairying to fat lamb production.

Increased production from pastures is expected with increasing fertility and improved subdivision and pasture utilisation, lessening of the amount of paspalum, and increased use of prairie grass, cocksfoot, and probably Italian and long-rotation ryegrass.

Farming will probably become more diversified, with increased vegetable and fruit production and possibly tobacco growing along the coast.

District Research Work

Essential to Advisory Officer and Farming Efficiency

UNTIL many of the problems which still await solution on the hills and in the valleys remote from central experimental stations become nearer solution, there must be more district research work of the type carried out by district farm advisory officers, Mr J. W. Woodcock said in his presidential address to the New Zealand Grassland Association's annual meeting at Tauranga in October. District officers who know a district intimately, who grasp the significance of an idea, who can pick out ideal locations for its investigation, and who painstakingly work out details could obtain results which could be impossible to obtain at a research station. It would be a retrograde step to divorce farm advisory officers entirely from the kind of experimental work they are doing, said Mr Woodcock.

THE "Proceedings" of the association recorded contributions to grassland advancement and their application to farm practice that had certainly been significant factors in the great achievement of New Zealand farmers in increasing production from grasslands in the last 30 years by 67 per cent for dairy products, 114 per cent for meat, and 123 per cent for wool. To some, this might represent a solid achievement, especially when the difficulties of the war years were considered, but to others progress made might not seem so impressive in view of the $\frac{3}{4}$ million acres of extra land developed since the war, the great productive advantage aerial topdressing had given the hill country farmer, the availability of improved pasture strains, closer subdivision of farms, weed control with hormones, and the use of new insecticides.

The research worker, used to measuring his results under fairly controlled conditions and having visualised the great impact his work was likely to have on production, was often disappointed at the progress made and even implied that knowledge obtained has remained largely unused or ignored.

"In view of the fact that we are spending about £1,800,000 annually on agricultural research, the statement that scientific knowledge remains unused is a serious indictment," said Mr Woodcock.

> **"While I agree that farm production could be greatly increased if all existing knowledge were applied, I do not agree that knowledge from research in New Zealand has been largely unused or wilfully ignored. I believe that New Zealand farmers recognise full well the value of research, and that most grassland farmers have participated in the findings or fruits of research carried out within the last 20 years. . . ."**

The Government extension service had been criticised on many occasions for alleged non-application of scientific

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knowledge on farms and inability to provide more advice to farmers on the complete farm unit. There was complaint that farm advisory officers had too many other duties to perform, and some critics even suggested that experimental work or other investigations should not be included in their duties, but it was necessary for an extension worker to carry out some investigations before he could become fully confident and conversant with the peculiarities of his district.

Much more profitable extension work could be done if there were more farm advisory officers. Farm advisory officers had many varied duties which detracted from true extension work, but which were vitally necessary; in spite of their low numbers, their varied tasks, and their inability to spend more than a short time on any particular farm, they had made significant contributions to the increased production from New Zealand grasslands in the past 30 years. They had had to play a leading part in research applied to the varied soils and climates of the Dominion.

Many Variables

One of the difficulties of extension work, especially in translating findings from the eight agricultural stations or substations in New Zealand to farm practice, was that the country covers a longitude of nearly 900 miles and contains over 1,000 soil sets each containing several major types. The rainfall varies from well over 100 in. to as low as 12 in., and pasture production from the same field could range from 6,000 lb of dry matter per acre in one year to 14,000 lb in another. These variables must be accepted as problems confronting both extension officers and farmers in most districts. Farmers themselves were variable: in age and temperament, in their financial status, the support they received from their families, the labour they employed, and the stock they had available. Repeated references were heard to the soil, plant, animal complex. The extension officer had a greater complex to deal with, that of soil, plant, animal, and man; and man was perhaps the most complex.

This variation of individuals or of farm resources, superimposed on a complexity of soil types, with difference of rainfall and variable seasonal production, was the problem confronting the extension officer, who was expected to translate the findings of research stations, which were often merely general principles, into farm practice.

To accomplish this to his own satisfaction, said Mr Woodcock, the extension officer must himself carry out experiments to see how these general principles fit his local conditions.

Fertiliser Response Survey

"It has been necessary for extension officers to carry out a fertiliser response survey of New Zealand proceeding alongside the valuable soil survey conducted by the Soil Bureau of the Department of Scientific and Industrial Research. By this means it has been possible to define those soil types responsive to phosphate, lime, or potash in addition to phosphate. With such basic information soil testing can be relied on to determine variations from farm to farm or paddock to paddock caused by differences in management on the same farm.

"By carrying out field experiments, extension officers were able to determine the effectiveness of the trace element molybdenum on certain soils, and because there is as yet no satisfactory quick test for this element, the knowledge gained by the field experiment is still the only criterion.

"Field officers are still working out the soils that require sulphur in addition to superphosphate, and there is evidence to suggest that on some areas sulphur is the dominating deficiency. From this information being gathered it is hoped that it will be possible for the Rukuhia Soil Research Station to obtain a reliable quick soil test for sulphur deficiency to assist farm advisory officers of the future. W. R.

Results of a ryegrass varieties farm grazing trial on Dr R. N. Akel's farm near Whakatane being discussed during the field day by Mr S. R. Hewitt, Farm Advisory Officer, Department of Agriculture, Whakatane. The new long-rotation ryegrass of the Grasslands Division, not yet released for certification, was among the strains tested. At left are Dr Akel and, partly obscured, Mr H. Woodyear-Smith, vice-president-elect of the Grassland Association.

Lobb, working in North Otago on a large series of field trials, was able to ascertain with a great deal of confidence which soils in his district responded to molybdenum and those which required sulphur as the outstanding nutrient. He was thus able to establish standards on which to base his advisory work in a district which had its own peculiarities.

"Although the pattern of fertiliser needs of our soil types is gradually emerging, there are isolated areas which still seem to require something which is not phosphate, potash, lime, sulphur, or molybdenum. Occasionally copper deficiencies for growth, as well as for animal thrift, are found. But very rarely do the other recognised trace elements appear to be effective even on the problem areas.

"All this work, and it has been considerable, has been vitally necessary to give extension officers the facts they needed on which to base advice. It has been made possible only by all the farmers who have willingly made available their fields for experimental work.

"This fertiliser response survey, initiated by A. W. Hudson in 1931 and supplemented by the soil survey commenced by L. I. Grange and N. H. Taylor about the same time, has been a monumental task over 30 years and is undoubtedly a major contribution to grassland research in New Zealand."

New Long-rotation Ryegrass

"Another Outstanding String to Agricultural Bow"

ASSERTING that he was sure that in the new long-rotation ryegrass developed by Grasslands Division of the Department of Scientific and Industrial Research at Palmerston North New Zealand had another outstanding string to its agricultural bow, Dr P. D. Sears, Director of the Grasslands Division, gave the annual conference of the New Zealand Grassland Association at Tauranga in October some characteristically pungent comments on results and observations of the field testing and seed multiplication stages that have been reached with the new strain.

THE new strain, said Dr Sears, had been developed over the past 15 years or so by appropriate crosses between perennial and short-rotation ryegrass, with the selection emphasis toward the dense perennial ryegrass type of plant. In other words, the effort had been to develop a perennial ryegrass with more palatability and more winter growth than the true perennial. It was the final step in Sir Bruce Levy's concept of a series of true New Zealand ryegrass strains, from the Western Wolths, Italian, and true perennial to the rotation types suitable for different farming systems.

"These have all now been produced", said Dr Sears, "largely by the genius and painstaking green fingers of Dr L. Corkill and his team, which team is now led by his protege Dr P. C. Barclay.

"It is a classic example of how great a contribution to agriculture can be made by a small group of very high quality scientists, provided with good assistance and facilities, and knowing what they are looking for.

"Dr Corkill will, however, agree that the associated pasture and chemical studies at Grasslands, Plant Chemistry Division, and other research centres, and by farm advisory officers and farmers throughout the country have all added their more indirect help, even if only in defining merits and demerits of the various models, and thus in assisting the plant breeder in his clarification of breeding objectives.

Continuing Pasture Improvement

"This closely integrated programme between field, laboratory, and the plant breeder over the past 30 years has resulted in a continuing pattern of pasture plant improvement in New Zealand, with the objectives always in view of plants useful for actual pasture in the particular—and indeed somewhat unique—farming system of New Zealand. Essential features of this farming system include continued outdoor grazing on hill and lowland, high continued pasture productivity due to climate plus our national programme of soil fertility increase, low use of artificial nitrogen because of our excellent clover nitrogen potential, specialised seed production areas, but not very extreme regional specialisation of farming systems at the high production levels.

"Thus the basic aims in our pasture plant improvement have been in terms of greater and better spread of production under actual grazing, high palatability at all growth stages, disease resistance, good herbage production even in the specialised seed production areas, and, for simplicity in the seed trade and certification system, a strong bias toward national rather than regional strains.

New Strain's Versatility

"It is thus of considerable interest that while short-rotation ryegrass was originally produced to replace the old Canterbury ryegrass used there in its four-year rotation of crop and pasture, the strain has also proved of tremendous value all over the country."

The original concept of long-rotation ryegrass had been to provide a better ryegrass for the 10-year rotation of Southland, said Dr Sears, and it was doing extremely well there, where it would undoubtedly be used to a great extent; but it would have to perform remarkably well to displace short-rotation ryegrass there, as this strain also did very well indeed in Southland's long winter and moist summer and autumn.

"Long-rotation ryegrass, however, is also proving really outstanding on our other extremes of soil and climate: on the dry and sandy areas and also in this warm north. In these areas its better winter growth than perennial and its much better (to date) summer growth and persistence (even with Argentine stem weevil present) than those of both perennial and short-rotation make it of obvious greater value. My impression so far is that it is not very far behind paspalum in its summer growth and of course well ahead of it at all other seasons. But we have to do much more farm and field trial on this strain before we finally offer it to the Department of Agriculture certification scheme.

"However, we are doing preliminary multiplication for pedigree seed supplies as well as for wider-scale farm trials, as so far we have had only minor worries related to some slight summer scouring in lambs and also some frost-burn under lax winter management.

"The new strain thus offers plenty for discussion at this stage, but it is one with plenty of the herbage growth attributes we are all looking for, and it also has plenty of 'body' or 'guts' in its tillering and recovery ability to stand up to the required corollary of very heavy stock traffic in utilising its high productivity throughout the year. Its relatively high palatability should fit in well with associate clovers. . . .

"From our preliminary trials it looks as though we have in it most of the best attributes of the perennial and short-rotation. It should give us that extra growth and extra animal carrying and feeding, and thus the extra flexibility we are always seeking. But I am sure that we will still have to use common sense and continued attention to soil fertility, insect control, and grass and clover balance to get the best out of it."

Mr D. N. R. Webb Appointed Agriculture D.-G.

THE appointment of Mr D. N. R. Webb, at present Director-General of the Department of Lands and Survey, to succeed Mr P. W. Smallfield as Director-General of Agriculture when Mr Smallfield retires at the end of March next year, was announced by the Public Service Commission in November.

SON of a farmer, Mr Webb joined the Department of Lands and Survey's North Auckland office in 1926 and has been closely associated with the large-scale land and farm development projects of that Department and with servicemen's and civilian land settlement.

He was appointed Assistant Director-General in 1957, and Director-General a year later, of a Department whose imaginative and highly successful tackling of the development of large blocks of land for farm settlement has earned it the title of "the biggest farmer in the country".

Under his Department's current programme 50,000 acres of new grass is being sown annually, either as first grassing of new blocks or as renewal of deteriorated pastures. Just under a million acres is at present under development, which is the highest current acreage in the Department's development work to date; it excludes the 450,000 acres of the Molesworth run, which the Department has controlled for some years and is re-establishing with the grazing management of run cattle.

On the Department's blocks that are developed to the established pasture stage but not yet taken over as farm units by settlers, more than a million sheep and 163,000 run cattle were being carried at 31 April this year, and the current wool clip is almost 10,000,000 lb.

Mr Webb became closely associated with land settlement early in his career when in 1930 he was transferred to head office in Wellington and began work on the establishment of settlers under the Small Farms Scheme for relief of unemployment. When the Rehabilitation Board was set up he was seconded from his Department as secretary to a lands committee that advised the Government on schemes for the settlement of ex-servicemen.

When the Rehabilitation Department was established Mr Webb was transferred to it to take charge of its farm settlement scheme. His experience with the grading of applicants for settlement, the arranging of short courses at the agricultural colleges, and the preparation of reports on surveys and investigations for farm advisory committees on the scope for settlement on other than the conventional dairy and sheep units gave him wide practical knowledge of the economics and practice of the diverse fields of primary production.

In 1945 Mr Webb was private secretary to the Minister of Lands and Rehabilitation and in 1947 he returned to his Department's head office as Assistant Chief Clerk and then Chief Clerk (later Administration Officer).

For a short time in 1947 he was Commissioner of Crown Lands in Nelson and from 1954 until his appointment as Assistant Director-General he was Commissioner of Crown Lands in Wellington.

Mr Webb.

As chairman of the Marginal Lands Board Mr Webb has encouraged the development by private interests of much deteriorated and second- and third-class land that, with the assistance of new knowledge and new techniques, has become economic to develop and is adding appreciably to the country's primary production potential. He is also chairman of the Land Settlement Board and the National Parks Authority, and a member of the Soil Conservation and Rivers Control Council.

First Compulsory Tb Eradication Areas

GOLDEN BAY, Southland, and Wallace Counties are to be the first declared areas in which all dairy cattle are to be tested for tuberculosis. This was announced by the Minister of Agriculture, Mr Hayman, at the conclusion of discussions with the Dairy Board and Federated Farmers.

"RECENT difficulties in introducing the Dairy Board's Tb area eradication scheme have now been overcome," said Mr Hayman, "and the scheme can now go ahead as originally planned. Initial testing of dairy herds on a voluntary basis will be resumed in December.

"Farmers in Golden Bay County are to be commended on their initiative in having had more than 14,000 cattle tested. There remain only a dozen or so herds to be tested and these will be done as soon as possible. As the incidence of Tb in the area is very low, Golden Bay is likely to qualify as a Tb-free area soon after testing has been completed.

"The whole area south of the Waitaki River is to be declared a compulsory testing area before very long. Testing will begin in Southland and Wallace Counties about February and when under way will be extended northward through Clutha, Bruce, Taieri, Peninsula, Waikouaiti, Waihemo, Maniototo, Vincent, Lake, and Waitaki Counties. Next year some of the low-incidence areas of the North Island will also be made declared areas in which testing will become compulsory.

"Dairy farmers in declared areas are to be notified when testing is to begin and will receive a brochure giving details of the procedure. Testing will be allotted by the Department to club and private veterinarians and to its own testing staff.

"Compulsory testing will apply not only to all cows in factory supply herds but to house cows. For some time," said Mr Hayman, "the Government has been concerned at the large number of people in rural areas exposed to the danger of Tb infection from milk that is not pasteurised or that comes from untested cows. To eliminate this hazard the Government has agreed to test all cows kept for supplying milk for individual households and will meet the cost of such testing."

Outside the declared areas already mentioned testing is to proceed as formerly.

Factory supply farmers who have not so far had their herds tested may arrange this through their nearest Department of Agriculture office. Application forms will be available shortly.

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Barley Grass Can be Eradicated

By E. A. MADDEN,
Farm Advisory Officer (Agrostology),
Department of Agriculture,
Palmerston North

Barley grass thrives on fertile soils of stock camps, in sunshine or shade.

BARLEY grass (*Hordeum murinum* L.) is an introduced annual which has become widespread in New Zealand since its arrival probably 80 years ago.

IT is disliked by stock. The long-awned seeds are troublesome, they penetrate the skin and irritate and injure eyes, and if lodged between teeth, cause suppuration of the jaw and loss of condition. Injury to feet of sheep and dogs is not uncommon. Pelts punctured by seeds are devalued.

Being unpalatable and a prolific seeder, barley grass can spread rapidly and widely from small infestations which usually occur on sheltered stock camps and near haystacks. Pastures opened by drought, close grazing, pugging, etc., are as suitable as stock races for barley grass establishment.

It thrives best in highly fertile soils, but is not restricted to them. It cannot therefore be eradicated by the simple process (as with some weeds) of raising fertility and inducing rapid and competitive smother by other grasses and clovers.

Every effort should be made to prevent the spread of this objectionable grass. Its eradication, particularly in the early stages of its encroachment and establishment, should present no real problem except on steep land. Merry (1) has shown that it can be eradicated by spraying with 2,2-D ("Dalapon").

Identification

Plants are fairly erect and tufty, but may be lax and spreading in open swards. The bud shoot is rolled (Fig. 1), as in Yorkshire fog, and not folded, as in cocksfoot. Leaves are usually of a lighter green than those of most other grasses and they taper gradually to a fine point. Leaves and sheaths are hairy to varying degrees. Many leaves have wavy or twisted margins and the mid vein on the back of the leaf is distinct. The white ligule (Fig. 1) is prominent, but not as long as in cocksfoot. Well developed auricles (clasping ears) are present (Figs. 1 and 2).

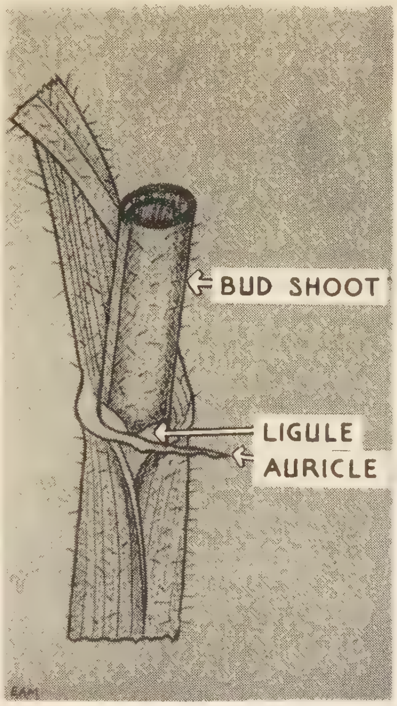

Fig. 1—Sheath is split and usually overlapping; size and length of auricles are inconsistent.

Ecological Requirements

Barley grass grows in soils that are wet or dry, hot or cold, rich or poor, or in shade or full sunshine. It can produce mature seed below mowing height over a long season. Fortunately the seeds do not remain viable for very long after they have fallen (Harris (2)). Prevention of reseeding is therefore essential in its elimination. Seeds can be brought on to a pasture by stock and by the feeding of hay containing barley grass.

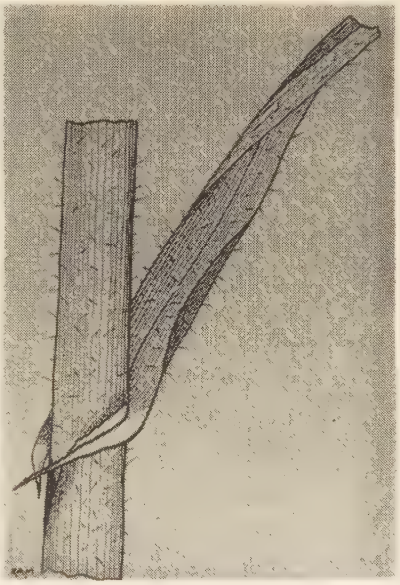

Fig. 2—Leaves may be twisted or have wavy margins; the degree of hairiness is variable.

Seaside barley grass (*Hordeum marinum* Huds.) must not be confused with the previously described species. They both have the same objectionable features, but as seaside barley grass is rarely found away from sea marsh saline land, it is not such an obnoxious and aggressive pasture weed as barley grass. Whereas barley grass has distinct auricles, seaside barley grass has no auricles and the plants are usually a deep blue-green.

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1. D. M. E. Merry, "New Zealand Journal of Agriculture", vol. 101, No. 2, p. 119, 1960.

2. G. S. Harris, "Proceedings of the Twelfth New Zealand Weed Control Conference", p. 88, 1959.

More Care Will Reduce Country Drownings

ARE country dwellers in New Zealand doing all that could be reasonably expected to eliminate water hazards on and around farms? The National Water Safety Council's annual survey of drownings for the year ended 30 April 1961 suggests that with more care water fatalities in country areas could be greatly reduced.

Supervision of children playing near water races, channels, pools, ponds, and lagoons and the covering of wells, tanks, sheep dips, water troughs, and open drains are necessary precautions suggested to reduce drownings. Others are the education of children in water wisdom and instruction in swimming at an early age.

Rivers and streams are dangerous places for swimmers, having claimed 29 victims during 1960-61. This was a decline on the number of drownings in 1958-59 (32) and 1959-60 (35), but there is still need for greater care, says the survey. Rivers and streams are notoriously treacherous and full of hidden hazards, such as snags, holes, and submerged rocks. Even the safest pools can change overnight and should be thoroughly investigated before being used for swimming, the survey warns.

The 112 drownings in New Zealand during 1960-61 were in a wide variety of locations including creeks (8), lakes and lagoons (4), swimming baths (3), open drains and ditches (2), pools and ponds (2).

Ram Fairs

The following are dates and venues of ram fairs up to the end of March:

11 January—Masterton (long wools) at Masterton.
23 January—Second Feilding at Feilding.
25 January—Southland Stud Southdown at Invercargill.
30 January—Masterton (Southdown and mutton breeds) at Masterton.
9 February—Dannevirke at Dannevirke.
24 February—Southland Flock (all breeds except Romneys) at Invercargill.
27 February—South Otago at Balclutha.
7 March—Southland Flock (all breeds except Southdowns) at Invercargill.

Book Reviews

"Sheep (Part 2: Sheep Farming Development and Sheep Breeds in New Zealand)": P. G. Stevens

THE publication of the companion volume to Part 1, published two years ago, completes a valuable and long-awaited book. The two volumes fill a long-felt want, as from no other single source can so much information on New Zealand's important sheep industry be derived.

Surprisingly Mr Stevens deals with the history of our sheep farming in this second volume rather than the first, but this in no way detracts from its interesting presentation in the first seven chapters. These include the advent of refrigeration and its effects, scab and its eradication, rabbits versus sheep, and the changing environment. Chapter eight, "A Year of Production in the Sheep Industry", deals with the changes in sheep numbers and farm management through the four seasons.

Chapter nine serves as an introduction to the various breeds of sheep run in this country, and is followed by 16 chapters on individual breeds. Logically enough the more important ones, such as the Romney and Corriedale, are dealt with at some length, compared with such lesser lights as Dorset Downs and Hampshires.

The final chapter, "Other Breeds", is an interesting one which mentions a number of breeds which have at some stage been introduced to New Zealand, but which for various reasons have failed to survive. They include such unlikely names as Wensleydale, Tunis, Dartmoor, and Roscommon.

There are 44 illustrations, seven figures, and 65 tables in this book of 181 pages, so it is obvious that the text is well sprinkled with other forms of information. The photographs are of a high standard and several are of considerable historical interest. It is a pity that some of the statistics are not more recent, but in many cases this is not the fault of the author, as recent figures are not always easily procurable.

The author has written these two volumes at an interesting and crucial stage of the development of the sheep and wool industry. Both meat and wool are now up against real challenges to find new markets and hold on to traditional ones against competitors. If Mr Stevens writes a third volume a few years hence, the chances are he will have some very interesting developments to record.

—J.E.D.

Whitcombe and Tombs Ltd. 17s. 6d.

"Poultry Management and Production": Allan A. McArdle

THE author's primary object has been to produce a book on practical poultry husbandry of maximum use for poultry farmers and prospective poultry farmers in Australia. All the economic and practical aspects of commercial egg production are fully discussed and well supported with diagrams and data. There are chapters on turkeys, ducks, and geese, and on practical aspects of poultry disease control.

The author's approach to his subject is as refreshing as it is practical. Though the book is primarily written for Australian conditions, it provides valuable information for New Zealand poultry farmers, and for reference purposes it will be a welcome change from other poultry textbooks used, which almost invariably refer to conditions in the Northern Hemisphere.

—F.C.B.

Angus and Robertson Ltd., Sydney. £A5 5s.

Wool Sales

The dates and venues of wool sales up to the end of June 1962 are:

18 December: Timaru.
10 January: Wanganui.
15 and 17 January: Auckland.
22 and 24 January: Napier.
29 and 31 January: Wellington.
14 and 16 February: Christchurch.
21 and 23 February: Invercargill.
28 February and 2 March: Dunedin.
6 March: Timaru.
16 March: Wanganui.
21 and 23 March: Auckland.
28 and 30 March: Napier.
4 and 6 April: Wellington.
13 and 16 April: Christchurch.
30 April and 2 May: Invercargill.
16 and 18 May: Auckland.
23 and 25 May: Napier.
29 May: Wanganui.
2 June: Wellington.
15 June: Auckland.

Manganese Deficiency in Wheat Corrected by Spraying with Manganese Sulphate

By C. C. McLEOD,
Farm Advisory Officer, Department of Agriculture, Timaru

MANGANESE deficiency symptoms in wheat occur as pale olive to yellow patches in crops, with characteristic debilitation of the affected plants. In a Department of Agriculture trial where the deficiency was severe spectacular response and significantly increased yield resulted from spraying with manganese sulphate in water solution.

MANGANESE deficiency in wheat has been recognised in parts of Canterbury, particularly on sandy soils in a dry spring. Some of the worst affected crops have been on the Waimakariri and Paparua sandy loams.

Characteristic symptoms of this trace element deficiency are pale olive to yellow patchiness in the crop. Affected plants are very soft in texture, stunted in growth, and tend to collapse. The older leaves soon die and eventually the whole plant may succumb.

Patchiness associated with manganese deficiency is due either to the presence of high, drier knolls in the paddock or to variations in soil depth, as in shallow, more free-draining hollows and depressions. Liming can also increase incidence of the deficiency and cause reduced yields.

In early September 1960 an Arawa wheat crop on Rangitata Island, South Canterbury, was showing the marked symptoms of manganese deficiency described. Until 1960 the paddock had been split in two and two rotations followed:

1. Lucerne, wheat 1956, rape 1957, wheat 1958, peas 1959, wheat 1960.
2. Grass, wheat 1958, oats 1959, wheat 1960.

When the deficiency symptoms were first observed, the wheat crop at the end of the second rotation had numerous patches showing marked yellowing, but most of the plants were healthy. However, in the wheat crop at the end of the first rotation almost all plants were markedly yellow and starting to collapse, but there were several very seriously affected patches.

The reason for the difference in degree of deficiency between the two blocks is probably that the area originally in lucerne had had 2 tons of lime per acre between 1950 and 1954, while the area previously in grass had had no lime.

Results of Soil Tests

Soil tests taken on 16 September 1960 gave the following results:

	pH	*Readily reducible manganese in soil in parts per million
1. From severely affected patches in the lucerne area	7.2	11
2. From yellow patches in the lucerne area	6.5	14
3. From yellow patches in the grass area	6.5	16
4. From healthy patches in the grass area	5.7	21

* Manganese reduced by hydroquinone, then extracted with calcium E.D.T.A.

The soil tests showed that the higher the pH (the soil's lime status) the less was the quantity of manganese available in the soil and the more severe were the symptoms of manganese deficiency.

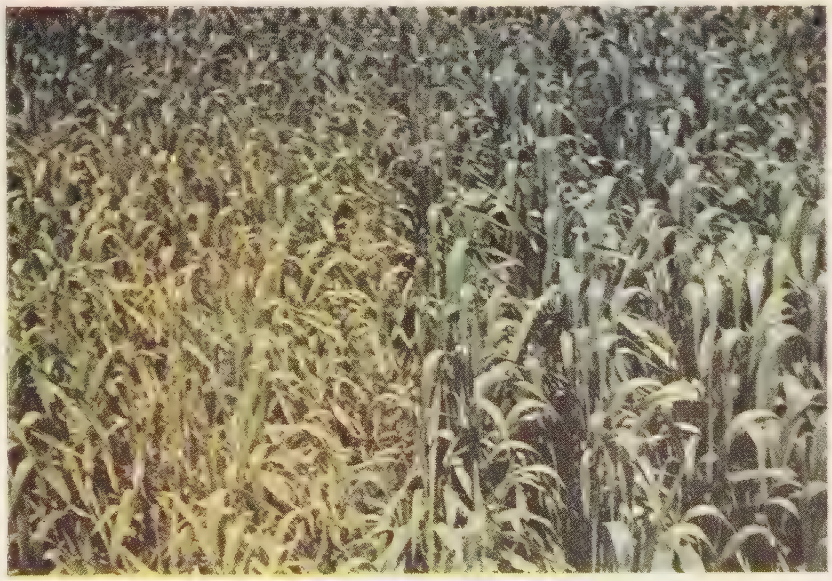
Wheat plants from the same four areas were sampled and analysed at the same time, results being:

	Amount of plant manganese in parts per million
1. Severely affected plants from the lucerne area	15
2. Yellow plants from the lucerne area	31
3. Yellow plants from the grass area	19
4. Healthy plants from the grass area	54

Plant analysis showed a marked reduction in the amount of manganese in the affected wheat, but phosphorus and potassium levels were very high in the yellow and severely affected plants, probably because their low manganese level restricted normal growth.

Spraying Treatments

At the time the soil and plant samples were taken (16 September 1960) a trial aimed at rectifying the deficiency was laid down on the area originally in lucerne. The treatments used were 5, 10, and 20 lb of manganese sulphate per acre applied as a spray in 15 gallons of water.



Response to treatment with manganese sulphate. Left—Untreated plot. Right—Sprayed plot. The wheat variety is Arawa.

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At spraying the wheat was 8 to 10 in. high, pale olive green, with many plants starting to collapse. Within three weeks of spraying marked responses to manganese application were seen, the treated plots being a dark green, healthy colour, while the unsprayed were yellow and unthrifty At this stage no visible differences between the rates of manganese application were visible.

By November the unsprayed plots were 24 in. high and still yellow, while the sprayed were 30 in. high, dark green, vigorous, and very flaggy. At this inspection the 10 and 20 lb of manganese plots were a darker green than the plots given 5 lb. The remainder of the paddock, sprayed with 10 lb of manganese sulphate per acre near the end of September, had also made excellent recovery.

In mid January 1961 marked responses to manganese application were still readily apparent. The unsprayed Arawa was 40 in. high, of very poor density, with the plots straggly and very weedy with fumitory. The ears of wheat were medium to large and moderately well filled. In contrast, in the manganese-treated plots the Arawa plants were 45 to 48 in. high, very dense, with large, well filled ears. The response to manganese application was most spectacular.

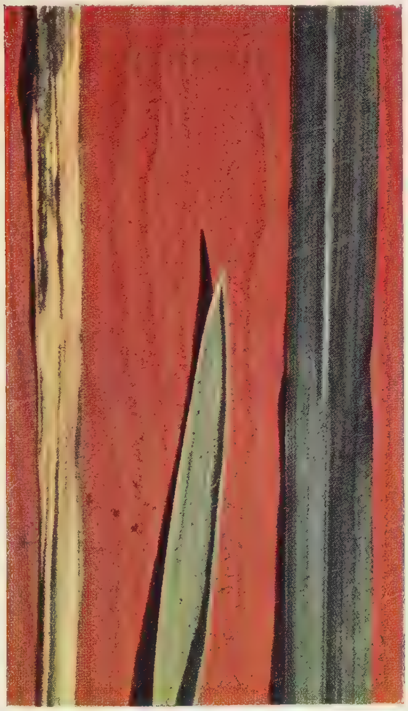
On 28 January 1961 the trial was sampled for yield and gave the following results:

Treatment	Yield in bushels per acre
No manganese sulphate	30
5 lb manganese sulphate	57
10 lb manganese sulphate	60
20 lb manganese sulphate	67

The response to manganese application was statistically significant; the difference in yield between 5 lb and 20 lb was also statistically significant.

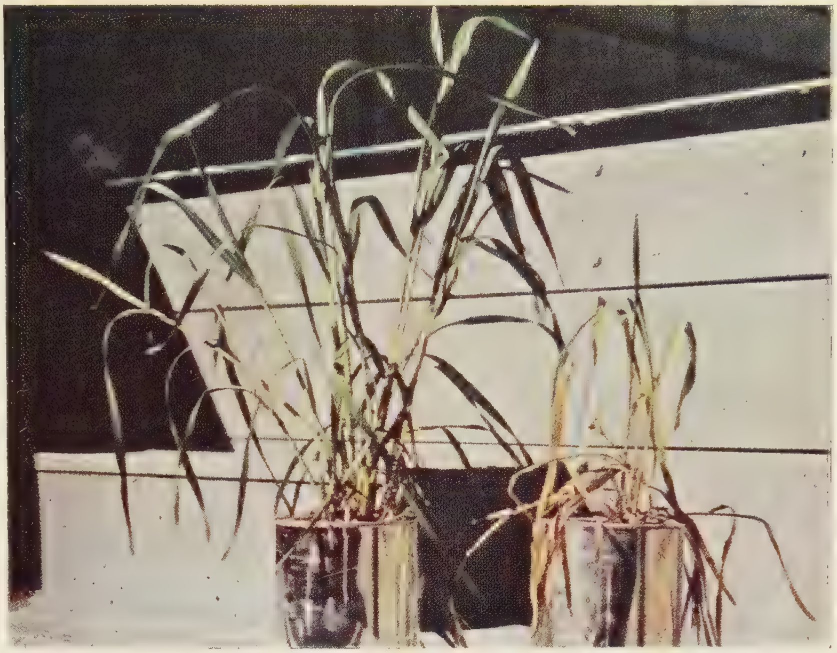
Conclusions

The trial showed that where there is manganese deficiency in wheat, good yield increases can be expected by spraying the crop with manganese sulphate. As soon as the very characteristic deficiency symptoms are seen affected crops should be sprayed with a solution in water of 20 lb of manganese sulphate per acre.



Leaf symptoms of manganese deficiency in wheat. The left and middle leaves are diseased and the right one is healthy.

MANGANESE DEFICIENCY IN WHEAT



▲ Contrast between a healthy wheat plant (left) and one showing manganese deficiency.

▼ Wheat in an affected patch. Leaves are discoloured and growth is lax.

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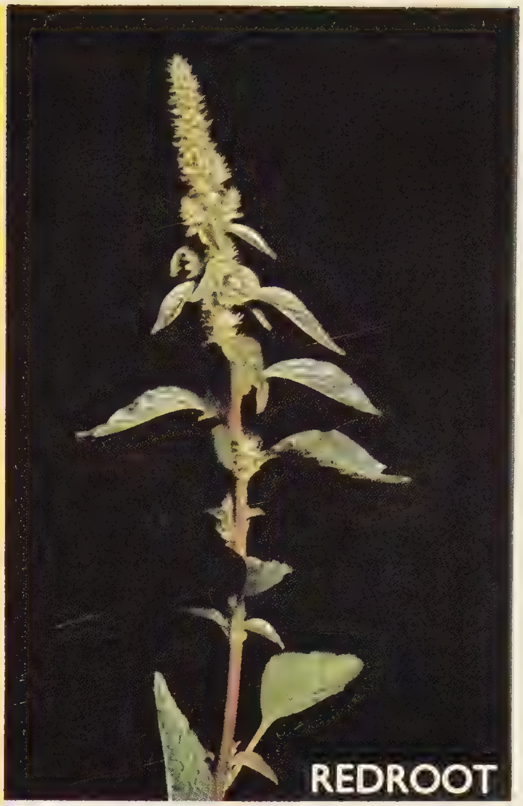
WEED IDENTIFICATION AND CONTROL

By L. J. MATTHEWS,
Principal Scientific Officer,
Department of Agriculture,
Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.



Amaranthus hybridus, in the past identified incorrectly as *A. retroflexus.*

SEVERAL species of closely related plants known as redroot or Prince of Wales feather are annual plants belonging to the family *Amaranthaceae*, which is widespread in Pacific countries. Species in New Zealand probably all come from tropical America. The young stems and leaves of most members of this family are edible and are eaten in some underdeveloped countries.

REDROOT and Prince of Wales feather are common names applied to the *Amaranthus* species in New Zealand. Unfortunately *Amaranthus* species cannot be readily differentiated on easily recognised characters such as habit, shape of leaves, etc. Accurate identification depends on inconspicuous perianth members and utricles (membraneous covering of the fruit). Of the four species in New Zealand only three are worth considering.

A. J. Healy, Assistant Director, Botany Division, Department of Scientific and Industrial Research, has supplied the following key and comments:

"The three species can be separated in an **unsatisfactory** fashion on the basis of macroscopic characters:

"Stems slender, sometimes succulent, often many form the crown, prostrate or scrambling; plant green or more commonly with reddish-brown aspect. .... *A. deflexus*

"Stems stout, stiff, erect, often solitary; plant green or more commonly reddish-tinged ..... [common to both species below]

"Branches of flower heads slender, lateral branches drooping near tip .... *A. hybridus*

"Branches of flower heads stout, lateral branches short, forming a stiff terminal panicle .... *A. retroflexus*

"My collection through many districts of redroot-Prince of Wales feather material shows that it is almost all *A. hybridus*, and that *A. retroflexus* is rare. The above key would distinguish well grown plants of *A. hybridus* with poorly developed lateral head branches being identified as *A. retroflexus*. I can see no way to make a key based on macroscopic features sufficiently foolproof to cope with small plants, which grow in crops in some areas.

"The safest procedure would probably be to include the erect-growing Prince of Wales feather group under *Amaranthus* spp., which would be reasonable enough practically, since *A. retroflexus* occurs so rarely."

Why are *Amaranthus* Species Weeds?

Because of their tropical origin *Amaranthus* spp. are not often troublesome south of Nelson.

A. deflexus is a weed of railway ballast waste land, but often occurs in gardens and cultivated land; *A. hybridus* is very common in cultivated areas; *A. retroflexus* is also usually confined to cultivated areas.

Amaranthus spp. are prolific seeders and the seed requires further ripening after being shed from the plant. Seed germinates at intervals over a long time. Seed of *A. retroflexus* buried in moist soil at different levels germinated at intervals up to 40 years. Hence once ground is infested it is unlikely that *Amaranthus* spp. could be eradicated by cultivation alone.

Amaranthus spp. usually germinate in warm weather (usually late spring-early summer) and establish very rapidly under moist, warm conditions. They are capable of competing with and smothering slowly establishing crops such as onions, carrots, and peas.

Control

In general *A. hybridus* and *A. retroflexus* are more susceptible to herbicides than *A. deflexus*. In waste areas the best control of all species is obtained with 2,4-D preparations applied when the plants are in the seedling stage of growth. Plants show susceptibility up to the flowering stage

(Continued on page 537)

NEW ZEALAND'S BIGGEST SELLING AGRICULTURAL PUMPS . . .

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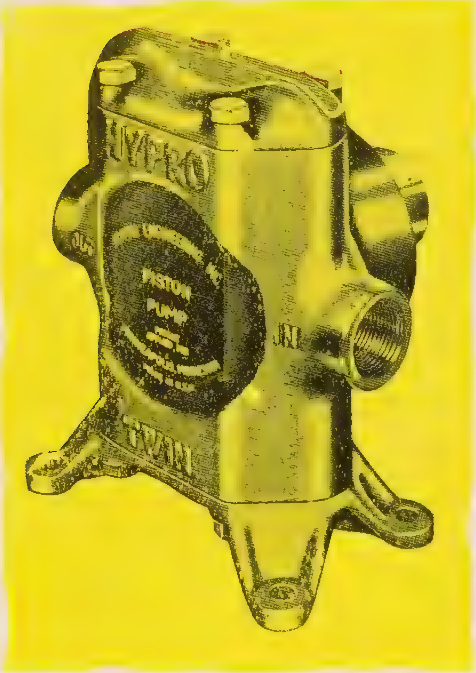
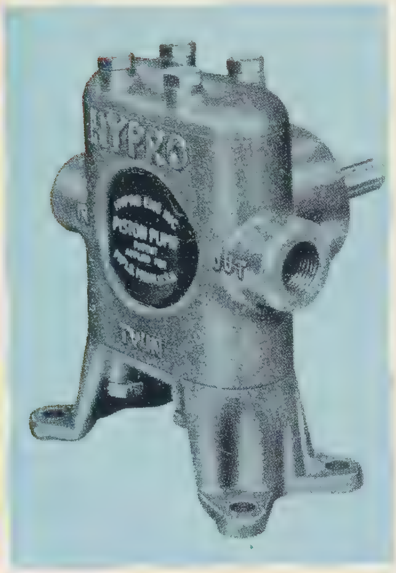


BIG TWIN — This pump can be operated at pressures of up to 400 lbs. p.s.i. and is adaptable for a wide range of uses, including crop spraying with abrasive chemicals. The performance greatly surpasses that of heavier and more costly ones.



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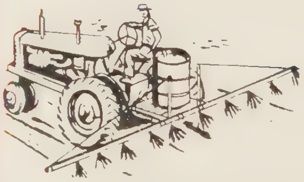

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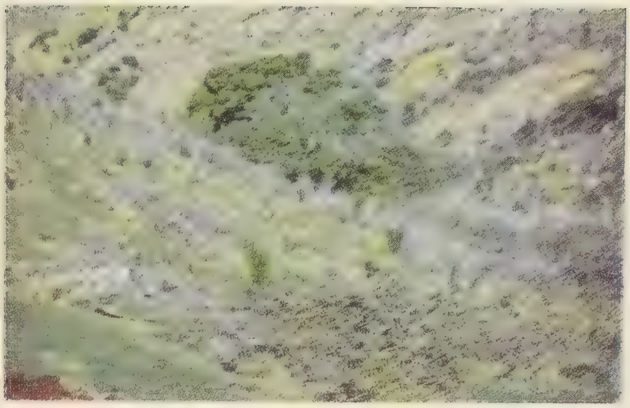
Blackberry Controlled with Goats and Electric Fence



▲ Blackberry infestation before control. Woolly sheep are in danger on such country, as they are caught and held in the blackberry runners.

TRIALS in northern Hawke's Bay with heavy concentrations of goats controlled by the electric fence have shown that goats could be used to far greater advantage in the eradication of blackberry.

THE Tangoio Demonstration Farm, about 18 miles north of Napier on the main road to Wairoa, like many other steep hill country farms in this part of Northern Hawke's Bay and the adjoining Wairoa County, is heavily infested in places with blackberry.

The blackberry thrives on the pumice soils under good rainfall, and steepness of the country has prevented control by the usual methods of cultivation and spraying.

Woolly sheep are caught and held in the blackberry runners, and the stocking of infested paddocks with such sheep is generally avoided.

Goats have been used in the past to help control the blackberry, as they eat the long runners and make the country safer for sheep.

The hormone weedicide 2,4,5-T is being used with success with blackberry, but it is a very expensive and time consuming method on steep hill country, and sprayed areas must be closely watched for reinfestation from surviving plants and secondary growth.

By J. R. VON PEIN,
Department of Agriculture,
Tangoio

Goats are being used in a trial at Tangoio Demonstration Farm as the first step in blackberry eradication on this type of country. Sheep and cattle are being run to provide revenue during the process, and topdressing and oversowing will play their part in the replacement of the blackberry with productive pastures.

Control by Goats

In August 1956, 50 goats were confined to a 59-acre paddock in an attempt to control a heavy infestation of blackberry. The hillsides were covered with medium-sized blackberry bushes, all having long runners, while one of the two main gullies was choked with blackberry varying from 3 to 7 ft high and 20 to 40 ft wide. The other main gully, which was later fenced as the second area, had large bushes scattered on each side. Periodically, as the feed position permitted, about 150 late shorn wethers and 45 bullocks were grazed on the area to help crush the blackberry, woolly sheep being in constant trouble on the paddock.

By March 1957 goat numbers were raised to 100. Twelve acres were fenced off from the main paddock, leaving 47 acres in the trial block, and two months later the area was further divided by a 4-wire electric fence, giving a higher stocking of goats per acre.

← Tall bushes two months after being grazed into from the sides by goats.

▼ Northerly face which was badly infested with low-growing bushes and now in suitable condition to be grazed safely with woolly sheep.

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BLACKBERRY CONTROL . . .

Except for brief spells the goats were kept in the more heavily infested area until March 1958. Though the goats showed the utmost respect for the electric fence, odd ones jumped between the top and second top wire without receiving a shock. However, to stop this the electric fence was altered by the addition of a fifth wire, the second from the top being used as the return. This was found to give good control. Three wethers were the only other stock to get through, doing so when the fence was shorted by wet grass.

Blackberry Severely Checked

By October 1957 the blackberry had received a heavy blow. All the runners had been eaten off and the bushes reduced to leafless stalks. The large bushes in the gully had been defoliated and trampled down to about 2 ft 6 in. high.

Burning was then carried out with some good results, as the crushed bushes carried a fire much more readily than the open bushes. After this the burns were oversown with a mixture of ryegrass and clover seed at 1 bushel of perennial ryegrass and 2 lb each of white and subterranean clover per acre. When the farm received its annual topdressing in January 1958 the area was given 2 cwt of superphosphate.

A month later the less infested second area was subdivided by a 4-wire electric fence into two paddocks of about 11 acres.

The two areas were grazed in turn for three to four weeks at a time and goat numbers were increased to 150. Sheep and cattle were used also as feed permitted.

The blackberry on these areas has been reduced to stunted, dying bushes, and dead, defoliated, long trailers that catch in sheep's wool are generally so brittle that any sheep caught break away without difficulty.

Stock Control Essential

Articles on blackberry control with goats have appeared in the "Journal" on several occasions in the past and experience to date is in line with their findings that efficient stock control is essential.

In the trial at Tangoio the electric fence proved a cheap and efficient means of goat control and allowed a high stocking rate.

The trial has shown that large numbers of goats at present free to roam over parts of Northern Hawke's Bay could be controlled with electric fencing to maintain high stocking rates on infested areas, and thus be used to great advantage in eradicating blackberry.

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Control of Redroot

(Continued from page 533)

at rates of ½ to 2 lb acid equivalent per acre. Preparations of 2,4-D are more toxic than equivalent MCPA preparations. The plants are also susceptible to amitrol at 1 lb active ingredient per acre and to 2,3,6-TBA at 4 to 8 lb active ingredient per acre.

Amaranthus spp. are not usually troublesome in cereals, in which they can be controlled by MCPA and 2,4-D at rates up to 1 lb acid equivalent per acre, MCPA/TBA at 4 pints per acre, 2-(MCPP) or mecoprop at rates up to 2 lb or 2,4-DP at rates up to 1 lb per acre. SMCA could also be used at rates up to 15 lb per acre. *Amaranthus* spp. are often troublesome in maize crops, but are controlled with simazine or atrazine at rates up to 2 lb active ingredient per acre applied as a pre-emergence application. Salts of 2,4-D are used commercially, but 2,4-D may damage maize.

Resistance to MCPB and 2,4-DB increases rapidly beyond the seedling stage, but in new pastures and lucerne adequate control may be obtained with 2,4-DB at rates up to 1½ lb acid equivalent per acre. If the pasture is dominantly red clover, MCPB should be used at the same rates. This preparation may also be used in pea crops, but often gives less satisfactory control than dinoseb.

In field brassicas in the absence of fat-hen, SMCA may be used at rates up to 15 lb per acre. All brassicas except turnips should be treated at the early growth stage (four- to six-leaf stage). With turnips it is desirable to allow *Amaranthus* spp. to overtop the crop before the application is made.

Good control of *Amaranthus* spp. is obtained in carrots with light aromatic oils, and the newly developed preparations dicryl, karsil, and solan show promise. Solan may also be effective in transplanted tomatoes.

As germinating seedlings *Amaranthus* spp. are controlled by many pre-emergence chemicals. In onions CIPC at the rate of 6 lb per acre is satisfactory. CDAA is also very satisfactory on heavy soils at rates up to 4 lb per acre, but less so on mineral soils. CDEC and CDEA give variable results and EPTC cannot be recommended for the control of this species.

Amiben at rates up to 4 lb active ingredient per acre secures positive control of *Amaranthus* spp., and may find a use in transplant brassicas, while dinoben may be of use in beans. In carrots propazine at rates of up to 2 lb active ingredient per acre may be used and in potatoes a mixture of 4 lb of dinoseb and 15 lb of TCA gives variable results.

On raspberries, black currants, and gooseberries simazine at rates of up to 1 lb active ingredient per acre shows promise, while in nursery stock, asparagus, and some bulbs neburon, diuron, and monuron are effective at rates up to 2 lb active ingredient per acre.

Amaranthus spp. are often troublesome in potato crops at time of harvesting. The most suitable desiccant is diquat applied at 1 to 2 lb per acre with a wetting agent about five to 10 days before harvesting. For optimum results it should be applied in bright, sunny weather. Other desiccants such as endothal at rates up to 8 lb per acre are less satisfactory.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given in January as follows:

2XP New Plymouth, 8 p.m.

11 January—Talk arranged by the Animal Industry Division, Department of Agriculture, New Plymouth.

18 January—Talk by Sheep and Wool Instructor, Department of Agriculture, Wanganui.

25 January—"News and Views of the Farm Advisory Division.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 12.33 p.m. ("Country Journal"), Thursdays at 12.33 p.m.

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report", followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays at 12.33 p.m.

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer"), and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m.

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XB Masterton, Mondays and Wednesdays at 12.33 p.m. ("Country Journal"), Wednesdays at 6.45 p.m. ("Masterton Stock Market Report"), Fridays at 7.45 p.m.

2XN Nelson, Thursdays at 8 p.m.

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest"), and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer"), and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service"), and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m., Thursdays at 12.33 p.m. ("News for the Farmer").

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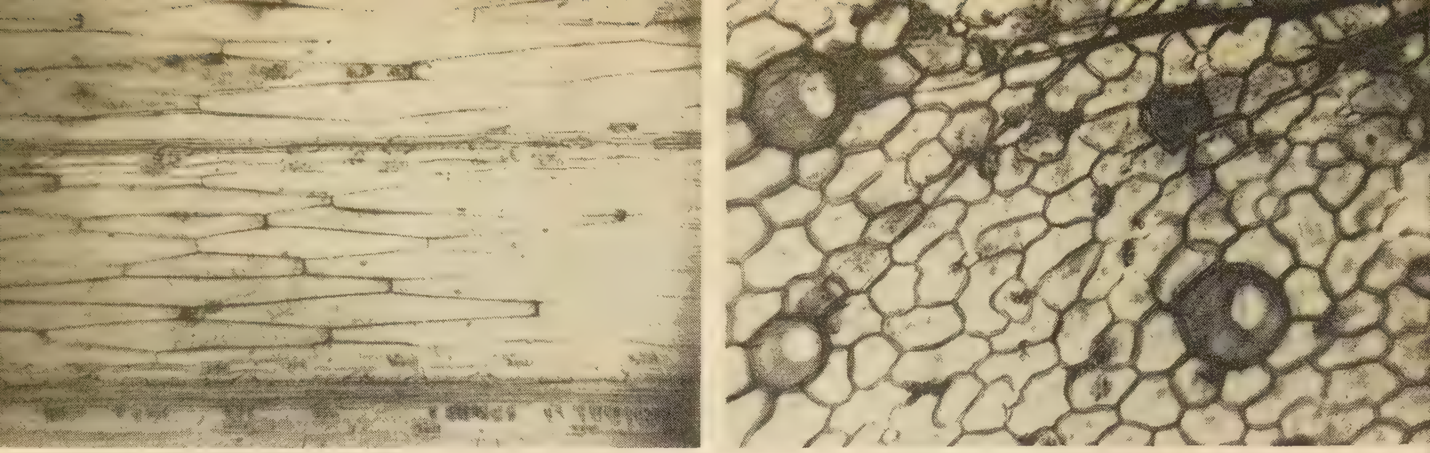


▲ The cell pattern typical of a grass (left) and a herb (right).

GRASSES have "FINGERPRINTS"

By BARBARA H. HERCUS,
Scientific Officer (Ecology), Department of Agriculture, Christchurch

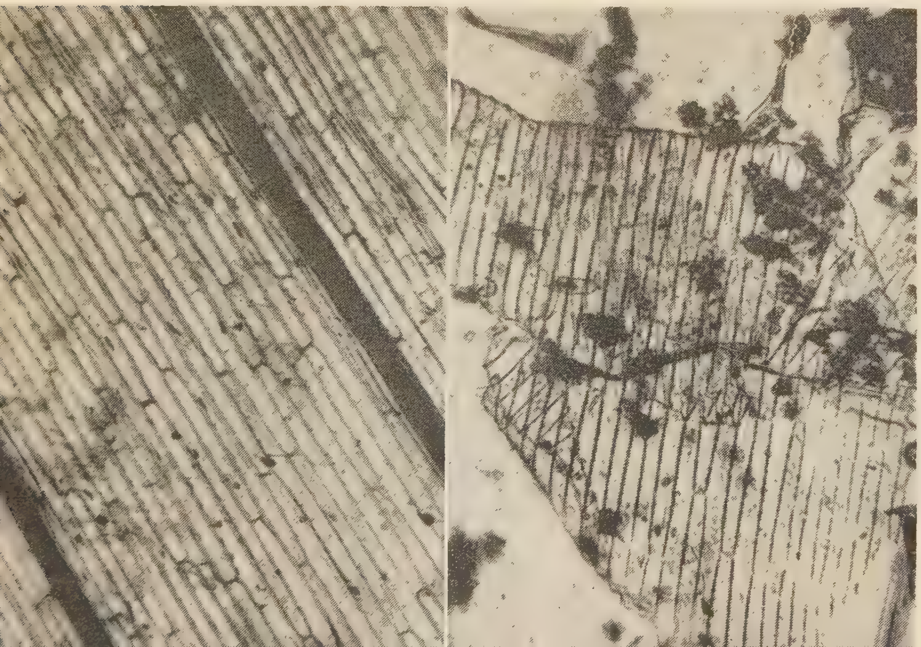
IN 1919 L. Cockayne drew up a tentative list of the palatability of tussock species and commented: "To ascertain that certain plants have been eaten the final decision must come from actually seeing a sheep feeding on a particular plant and proving from examination of the plant itself that a portion has just been bitten off. This is no easy matter."

In spite of considerable advances in animal nutrition we still do not know exactly which species an animal selects under extensive grazing. Botanical analyses before and after grazing and/or continuous direct observation of the animal still seem to be the only methods available. However, even these have practical limitations on extensive hill country.

A new research tool is now being developed using a botanical analysis of the faeces to determine which species the sheep eat on the tussock grasslands.

A SMALL detail of plant morphology attracted the attention of the French botanist Henri Prat some years ago. The characteristic pattern of the cells on the surface of the leaf had long been used to identify and classify fossil plants and Prat used the high degree of specialisation of those cells to classify the grasses into tribes, families, and species. The basic idea was applied by several authors to various problems, such as the diet of squirrels and the identification of impurities in commercial cattle feed, but it remained mainly of academic interest. In 1954 D. J. Martin in Scotland used the patterns of the epidermal cells to identify the remains of leaves found in the faeces of sheep grazing on heather moorlands. This method is now being developed in New Zealand to determine which species are grazed in the tussock grasslands.

Following the work of J. M. Hercus, Martin's method was given a preliminary try-out on fescue tussock in Central Otago at Ophir and Wanaka. The most important result of this investigation was that for each area the same plants were represented in nearly every sample. Then followed a series of experiments to confirm these findings and to improve the details of the technique. These experiments were done with stall-fed animals and sheep grazing on small plots of pure species and simple mix-



← "Fingerprinting" — comparing the cuticle print of ryegrass direct from the leaf (left) with one that has been through a sheep (right).

tures. Now we are again looking at the more complex mixtures of species that are characteristic of the tussock grasslands.

Basic Principles

The basic principles of the method are:

1. The outer surface of the leaves of grasses and herbs has a waxy cuticle which when separated from the leaf bears an imprint of and sometimes also part of the cells of the underlying epidermis.

2. The structure and pattern of arrangement of these epidermal cells are characteristic of the genus and often also the species of plant.

Method being Developed to Determine by Faeces Analysis Species Grazed on Tussock Grasslands

3. The cuticle is resistant to most chemicals and the action of microbial organisms. During the processes of digestion the cuticle is separated from the rest of the leaf and passes through the animal undigested.

4. The cuticle patterns from the faeces are identified by comparison with permanent slides, diagrams, and photographs prepared from fresh leaves.

Method

Fresh faeces are collected from the field, three or five samples if a collection is made daily over a period or 25 to 50 if only one collection is made. A list is compiled of all the species present in the sward and an estimate made of the relative abundance of each. A reference slide of the cuticle of each species, including both sides of the leaf and the stem, is required. These are photographed and diagrams of the details of cell structure, hairs, etc., are drawn. A file is kept of these details as they are prepared and these form a permanent reference collection.

Typical mid-altitude tussock grassland in Otago with variations in aspects, altitude, and vegetative cover.

A key and sketch diagrams are compiled of the distinguishing characters of any cuticle patterns that are somewhat similar, for example, several species of *Danthonia* or cocksfoot and prairie grass which look alike but differ in small details. Three grammes of each faeces sample are mixed in 100 grammes of water and three subsamples are taken from the suspension. These are examined under the microscope and each fragment of cuticle is identified as far as possible, using the photographs and diagrams for reference. The exact details are decided separately for each problem. We may be interested in the total list of species present, the presence or absence of a particular species at a particular time, whether only part of the plant has been eaten (leaf only or leaf and stem), or whether poisonous plants have been eaten.

Results

The results from Ophir and Wanaka gave us some useful information as to what was being eaten. Some 50 species were recorded in the sward and of these, 18 were always identified in the faeces. But this list of plants did not tell us how much of each species had been eaten. The quantitative use of the method is presenting a few problems and a brief resume of some of the background experimental work might be of interest.

Faeces were collected at intervals during the grazing of a small plot of tall fescue. After 13 hours the distinctive cuticle pattern of this grass was present and it formed nearly all the identifiable cuticle by two and a half days. It disappeared from the faeces when the sheep were moved to new feed. This pattern of excretion of the cuticle agrees closely with the known facts on the rate of passage of food through the animal. A similar result was obtained when faeces were collected from sheep grazing a series of half-acre blocks of different species for three to four days. The cuticle pattern of each species increased to a maximum between the second and third day of grazing and then disappeared from the faeces three to four days after the sheep were taken off that plot.

Where the sheep had no choice in what they ate, as on small plots of a single species or one grass and one clover, the proportion of cuticle was similar to the proportion of the species available in the field. Also when sheep were stall fed fresh-cut grass the cuticles of each of the species fed were identified in the faeces and in the same sort of proportion, for example, cocksfoot and browntop, which formed about 10 per cent of the feed and were found as 5 to 12 per cent of the cuticle fragments.

For animals grazing on mixed pastures with more than eight to 10 species, however, the picture is more complex. Here questions of relative palatability and selection by the sheep as well as inherent differences in digestibility make interpretation more difficult. These problems are still being considered, as these aspects are important for any quantitative work.

Current Work

While these problems are being considered there are, however, many problems that can be investigated on a qualitative, presence - or - absence basis. In this case we are interested in obtaining a list of the species eaten by a large number of animals without any reference to how much of each plant.

Work is at present being done on the following aspects:

1. The diet of sheep on burnt snowgrass country: On several sites a series of transects are being recorded to follow the botanical changes that occur after fire in snowgrass at 3,000 to 3,500 ft. A collection of faeces is being made over a period of years to study the species grazed in relation to the botanical changes that occur during the period of recovery after the fire.

2. Benmore disease or swamp fever: The typical symptoms of this disease are similar to those produced by several poisonous plants and a survey has been started to see if a particular plant has been eaten by infected animals and not eaten by the healthy animals. Twenty-five samples have been studied from the flock before the onset of any disease symptoms.

3. Opossum diet: Several series of samples have been studied. The simplest question was the first one: "Have these opossums eaten pasture grasses?" Now a survey is being made of three areas in Southland where we are interested to know "Have they eaten pasture grasses, clover crops, or swede and turnip crops?" We hope to include in this survey a fourth area in Southland where opossums have moved into the tussock grassland.

Reference

J. M. Hercus, "What Do Sheep Eat on Tussock Grassland?", "Journal of Agriculture", vol. 103, p. 73, 1961.

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Tussock Grasslands and Mountain Lands Institute "Review"

WITH the publication earlier this year of the first number of the Tussock Grasslands and Mountain Lands Institute's "Review" the Director, Mr L. W. McCaskill, gave notice of a vigorous and stimulating approach to a principal aim of the Institute, coordination and distribution of information to all those farming tussock.

The first issue was of modest proportions, but was attractively presented and full of worth-while information. The "Review" is envisaged as a means of personal contact on a two-way basis, with runholders contributing information that could be of benefit to others on improvement work done, costs incurred, results and benefits achieved, and methods of handling problems that may have arisen from improvement.

High-country Problem

Two such contributions in the first issue set the proposal off to a good start. Mr I. K. Ivey describes how on Glentanner Station the high-country problem of almost chronic malnutrition affecting most flocks of finewoolled sheep was tackled. Costs and labour demand ruled out some of the methods such as bought-in hay, growing more hay, and feeding concentrates, which in any case would not give the necessary long-term improvement.

As any improvement in the sheep flock had to start with the hoggets, the hogget block, most of it steep and covered in dense snowgrass, with gullies badly overgrown with matagouri and manuka, was given first attention. Burning in the spring of 1957 was followed immediately by oversowing, 2,000 acres being treated at a per acre rate of 1 cwt of fortified superphosphate containing sulphur at the rate of 400 lb per ton. A mixture of red, white, and alsike clovers and cocksfoot, timothy, and dogstail was sown. Legumes have established well and grasses are assuming some significance.

In applying the principles to other blocks it is intended to delay oversowing until a year after burning to allow useful tussock plants to improve in density and vigour and afford a better seedbed for the germinating grass and clover seedlings and better initial dominance of natives in the improved swards.

The methods have improved the cover of the country in regard to both sheep feed and soil conservation and in consequence have improved the production of wool and meat. The hogget wool clip increased by 70 to 80 per cent in the first year and the death rate dropped by 20 per cent, allowing some culling with a view to flock improvement, for which there was previously little room.

Place of Cattle in Tussock Country

The place of cattle in the tussock country is discussed by Mr J. Moir, of Glenlyon Station, in the second contributed article. His conclusions, after discussion of his management, are that cattle don't interfere with sheep work; they enable fuller use of existing labour; they improve sheep country and use feed otherwise wasted; they require nothing elaborate in the way of fencing; on run country no supplementary feed is required if the ratio of cattle to sheep is right; and Herefords are hardy and excellent for crossing.

A short history of the events leading up to the establishment of the Institute in 1960 includes the aims and objects of the Institute and the personnel of the committee of management.

The "Review" announces an offer by Lincoln College to supply a plan and the materials needed for farmers to carry out their own plot trials to find the most likely deficiencies influencing the establishment and growth of clovers in tussock country.

A short article on matagouri invites runholders to contribute further information on the plant for subsequent publication.

If the standard of the "Review" can be maintained in subsequent issues, it should be an excellent means of stimulating interest in and discussion of high country problems and of furthering the objects of the Institute. The Institute (P.O. Box 56, Lincoln, Christchurch) invites everyone farming tussock grassland to submit his name and address for inclusion on the mailing list for the "Review".

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CHANGE OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture" subscribers are required to give four weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" wrapper) and the new address should be sent to the nearest office of the Department of Agriculture. This notification should be made in addition to any given to the Post and Telegraph Department.

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Vegetable Growing for Home and Market Gardeners

Fungous, Bacterial, and Virus Diseases of Crops

VEGETABLE crops, because of their tenderness and quick growth, are readily susceptible to fungous, bacterial, and virus troubles. These diseases are dealt with in this article by S. P. MONEY, Horticultural Advisory Officer (Extension), Department of Agriculture, Wellington. Deficiency diseases, physiological problems, and soil-borne diseases of vegetable crops will be dealt with in later articles.

THE diseases are dealt with in their order of importance, which is fungi and bacteria; then viruses.

FUNGOUS DISEASES

Many fungi grow on tissue already dead, but most of the fungi which attack vegetables are parasitic on living plants. Knowledge of how fungi develop and spread is of great value to the vegetable grower, as he can then time his remedial measures better.

Bean Anthracnose (Scab)

Bean anthracnose (*Colletotrichum lindemuthianum*) is one of the most serious diseases of beans in New Zealand. It is present in all districts and attacks both dwarf and runner beans, though runner beans are more resistant. In early and late crops of dwarf beans, when conditions for anthracnose are most favourable, up to 50 per cent of infection of pods is often recorded, and occasionally in severe infections the whole crop may be lost.

Symptoms

Anthracnose is first observed on the stems of seedling plants as minute dark reddish specks. These rapidly enlarge to become sunken dark brown lesions, which later encircle the stem.

On leaves, the disease appears as small dark brown angular dead areas on the upper surface and as dark brown lesions along the main veins on the lower leaf surface.

Pod symptoms are circular dark brown spots, about 1/10 in. in diameter, which become lighter as the spots become bigger. Flesh-coloured spore masses are formed on the surface of the spots.

Spread of Disease

Anthracnose is spread mainly by infected seed, but it can survive in the soil for about two years. During the growing season it is spread by spores produced on infected plants.

Control

Anthracnose can be controlled by applications of bordeaux mixture or copper oxychloride at 14-day intervals. Varieties of beans resistant to anthracnose should be grown where the disease is troublesome or if spraying is not practicable.

Broad Bean Rust

Broad bean rust (*Uromyces fabae*) has caused much concern to vegetable growers throughout New Zealand, particularly in the North Island.

Symptoms

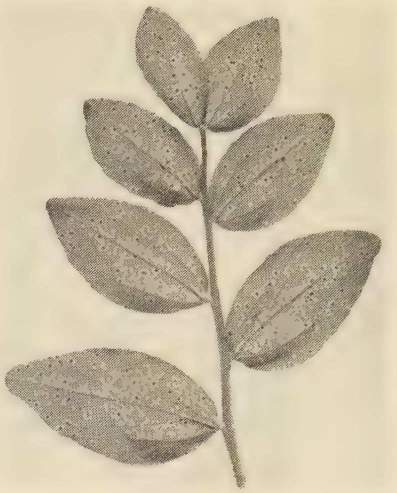
Pustules of rusty coloured spores appear on broad beans late in the season. Spores develop on both sides of the leaf and on the stem. In severe infections leaves are almost completely covered with spore masses and partial defoliation and stunting occur, with consequential loss of a large part of the crop. Plants do not often die of rust infection.

Spread of Disease

Rust is carried over from season to season as spores on bean crop refuse. During the growing season spores may be carried long distances from a diseased crop and infect healthy plants. Rapid spread of the rust is favoured by moderate temperatures and high humidity.

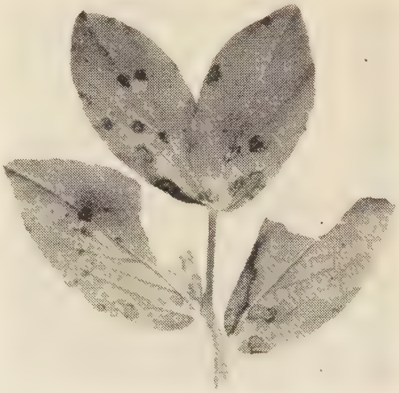
Control

All plant remains from a diseased crop should be gathered and burnt after harvest. In districts where rust is prevalent, combination sprays of lime sulphur and colloidal sulphur should be applied every 14 to 21 days. These sprays may also assist in reducing spread of the disease if they are applied early after first infection.



▲ Rust on broad bean leaves. A light area ("halo") surrounds the pustules of spores.

▼ Chocolate spot on broad bean leaf.



Chocolate Spot of Broad Beans

Chocolate spot of broad beans (*Botrytis cinerea* Fr. and *B. fabae*) has been causing concern in New Zealand, especially in crops grown for processing.

Symptoms

Broad bean plants develop brown spots on leaves and stems which, while superficially like the beginning of rust, do not have the dusty appearance of this fungus, and the spots are not as bright as those of rust.

Spread of Disease

Botrytis species live and multiply on dead tissue and from this source spores

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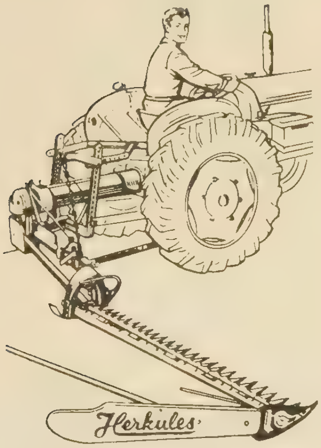

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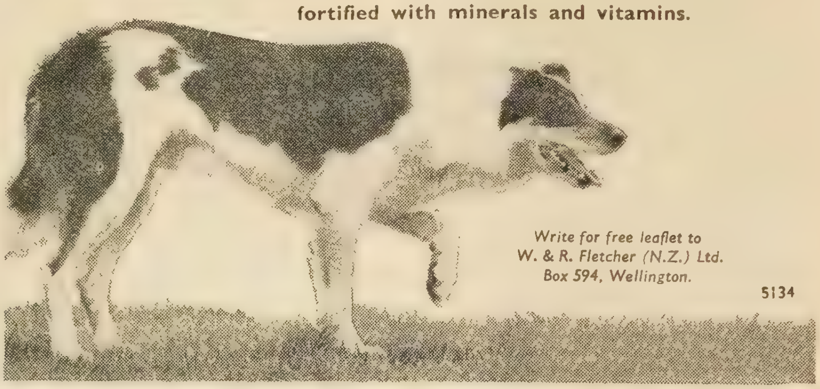

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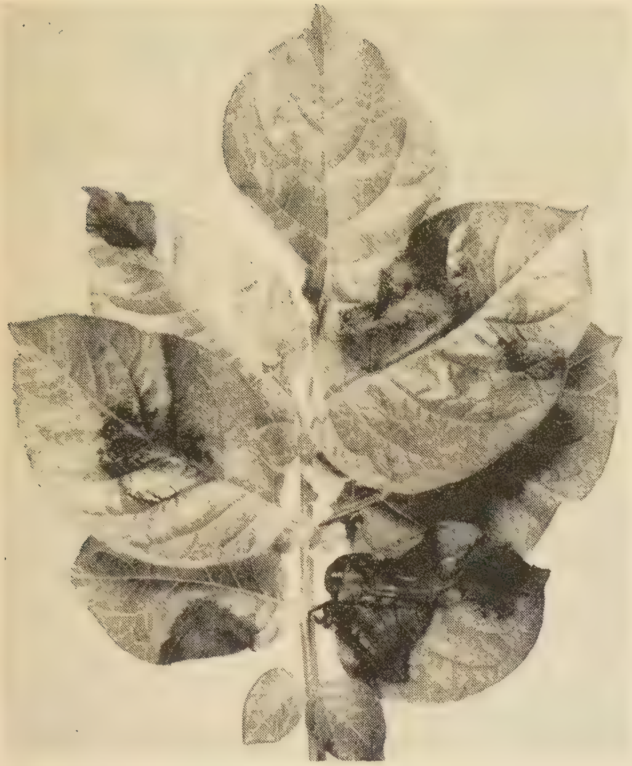

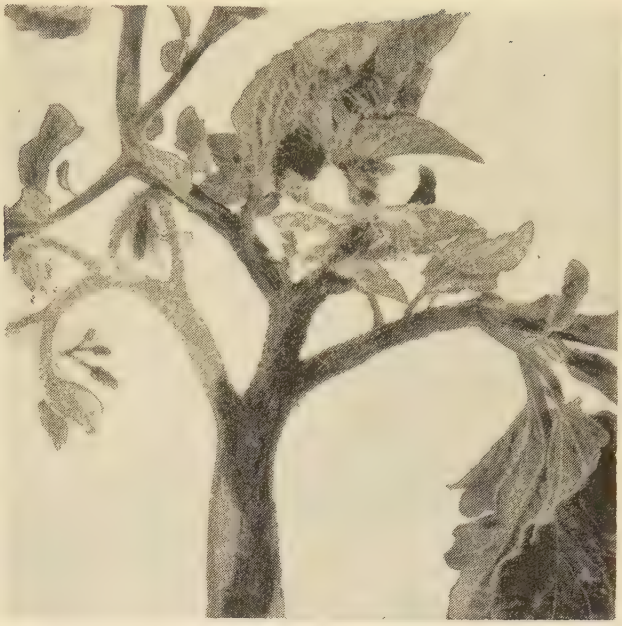

▲ Late blight on tomato, showing stem infection.

← Late blight on potato leaves. The darkened patches are early symptoms of the disease.

infect broad beans all through the season. Cold, wet conditions assist the fungi to become established, and the disease is more common on winter sown than spring sown crops. The disease is spread by wind-blown spores which germinate in cold, wet conditions when there is a film of water on the leaves.

Control

The disease is checked by a spell of warm, sunny weather, which may assist in control if sprays are applied immediately afterward. Seed dressing is recommended as a control and also regular spraying with fungicides.

Trials to determine the best fungicide for control of this disease are in progress at the Horticultural Research Station, Levin. Because infected debris is an important source of infection, this should be removed and burnt and strict crop hygiene observed.

Botrytis Rot of Lettuce

Lettuce crops in all major market garden areas in New Zealand are affected by botrytis rot (*Botrytis cinerea*, Pers.). Heavy losses through infection with botrytis occur in seedbeds and field crops.

Symptoms

When infection occurs in seedbeds, seedlings collapse with a soft, brown, water soaked rot. Heavy development of grey spores occurs on dead tissue. Sometimes leaf infections lead to a "collar rot" condition at ground level, causing the plant to become yellow and wilt when approaching maturity. In moist, humid conditions the whole head may rot rapidly.

Spread of Disease

Botrytis cinerea is a wound parasite. Spores landing on dead tissue grow rapidly, and in a tender plant such as lettuce a great deal of minor damage from cultivation, frost, or hail is usually present on which spores may germinate. High humidity necessary for spore germination is usually present in seedbeds and beneath the lower leaves of maturing plants.

Control

Reduction of humidity in the seedbed can be achieved by wider spacing of plants, which should be sown in rows. New blocks of lettuce should be planted away from old or infected crops. Spraying with thiram, zineb, or captan at 10- to 14-day intervals very soon after the plants are established in the seedbed enables a good protective cover to be maintained during this critical period. Spraying of mature plants in the field is difficult, because the growth habit of lettuces prevents a complete cover of spray from being applied satisfactorily; therefore, control measures at the seedbed stage should be as efficient as is practicable.

Onion Downy Mildew

All members of the onion family, including leeks, shallots, spring onions, tree onions, and multiplying onions, are attacked by onion downy mildew (*Peronospora destructor*), severe attacks of which may cause complete crop failure. Onion downy mildew is present in all parts of New Zealand and is particularly serious in the North Island. The disease causes reduction in yield and in the quality of bulbs, which become spongy and difficult to store because of their increased tendency to rot.

Symptoms

Onion downy mildew often begins in seedbeds and continues after planting out, though it is not uncommon for infection to appear first in the field. The first noticeable symptoms are small, light coloured, elongated spots on the leaves. These gradually enlarge until the affected areas become water soaked and appear white, flecked, or streaky; a greyish spore mass then develops. Leaves then shrivel and die.

Spread of Disease

The fungus is carried over from season to season on infected onion refuse, and during the growing season spores form in large numbers on infected leaves and are spread by wind and rain to neighbouring plants. Prolonged cool, wet weather produces ideal conditions for the rapid spread of this fungus, and refuse should be collected and burnt after harvest. Further onion crops should not be planted in the same soil for at least two years after an infected crop has

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been harvested. Seedbeds should be sprayed after plants are 2 in. high with copper oxychloride and white oil or dithane combined with a wetting agent. Spray application should be at 14-day intervals until growth ceases.

Late Blight of Potato and Tomato

Late blight of potatoes and tomatoes (*Phytophthora infestans*) can be serious in all districts of New Zealand, but is more prevalent in the warmer districts of the North Island. It is common in field crops, but can also cause considerable damage in tomato crops grown under glass.

Symptoms

The first symptoms are greenish brown or black water soaked patches on leaves and stalks. These rapidly enlarge and infected leaves become blackened as though killed by frost. In warm weather when frequent rains are experienced the fungi spread so rapidly that plants may be killed in a few days. Infection occurs near the stem of the fruit and water soaked areas appear on the fruit surface. These later turn greenish brown or brown, and though the surface of the fruit remains firm, these areas appear wrinkled.

On potato tubers dark, irregular lesions form, which later become sunken and darker. Affected tubers store badly, and many are lost through phytophthora rot, but also through other organisms gaining entry into diseased tubers.

Spread of Disease

Weather governs the spread of late blight. When moisture is abundant the fungus produces on the undersides of leaves and stems large numbers of spores which are splashed by rain or carried by wind to other plants. During hot, dry periods the disease remains alive in lesions, especially on protected lower leaves and on the stems. When favourable weather returns formation of spores is resumed.

Control

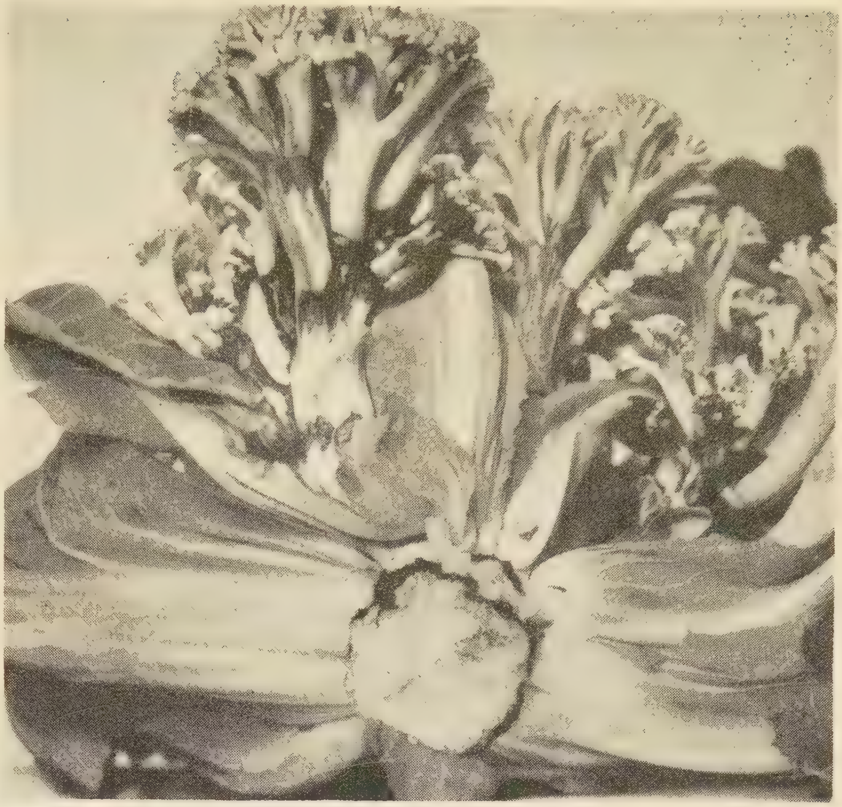
Bordeaux mixture and other copper fungicides have been used, but because the coppers have shown a tendency to "damage" the foliage, they have been largely superseded by the dithanes (bis diothio carbamates), which have shown less caustic effects. Regular spraying with these materials at recommended strengths gives good control.

Spinach Downy Mildew

Spinach is often grown in short rotation in market garden areas where three or more crops are grown on the same ground each year. Under these conditions spinach downy mildew (*Peronspora ~~in~~fusa*, Grev. ex. Desm. Rabenk) can be very troublesome in winter and early spring.

Symptoms

The disease begins with uneven yellowish areas on the upper surface of spinach leaves and a mass of grey to violet-grey spores on the lower surface. As the spots enlarge and multiply the whole leaf may turn black and die. In severe attacks the whole plant is killed. The disease can spread quickly in a few days.



[D.S.I.R.

Cauliflower head showing infection of black rot among flower stalks.

Spread of the Disease

The fungus is seed borne and may also be carried over on the debris of previous crops. Wind-borne spores are spread through the crop and send a fungal thread through the skin of the leaf, and within a few days further spores are being produced. As the spores require free water for germination, the disease is more prevalent in cool, wet weather.

Control

A rotation of three years or more should be practised when there has been trouble with spinach mildew. Infection should be checked by spraying with bordeaux mixture, and if the disease has not progressed very far through the crop, diseased plants should be rogued and destroyed and regular sprays continued to protect the crop.

BACTERIAL DISEASES

Bacteria are similar to fungi in the way the organisms feed and in that they are both devoid of chlorophyll. Most pathogenic species attacking plants thrive in cold, wet weather.

Bacteria are spread through rain splashing or by dew, are carried by insects, and sometimes are spread mechanically by cultural process. Bacteria gain entry to the host plant through the pores of the plant and through wounds. A few bacteria are also able to penetrate undamaged skin tissue.

Bacterial diseases of vegetables are more prevalent in cold, wet weather, but they can tolerate wide ranges of temperature and are more active in winter and early spring.

Soft Rot in Carrots and Turnips

Carrots, leeks, lettuce, silver beet, and young plants and fruits of the pumpkin family may be attacked by soft rot (*Erwinia carotovora*).

The organism is not a virulent pathogen and depends on injuries for entry to the plant. It is present in all market gardening districts in New Zealand.

Symptoms

Soft rot begins as small, water soaked, usually brownish spots which may develop until they join, and the

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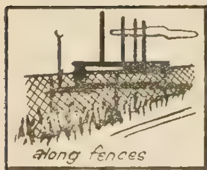

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whole leaf or the root is reduced to brown sliminess.

The disease spreads rapidly through crops such as silver beet in prolonged, cold, wet weather. Crops which have been harvested can also become infected if they are stored in wet conditions without being cleaned.

Spread of Disease

The disease is spread by rain splashes and is carried over on organic matter left from diseased crops. It is also carried on susceptible winter growing crops.

Control

Copper sprays such as bordeaux or copper oxychloride are applied in areas where this disease is prevalent to give protection and reduce its spread, but they are not wholly successful if there is prolonged wet weather during winter and early spring. Spacing crops such as silver beet at wider intervals to obtain good aeration between the plants can assist in reducing the spread of soft rot.

Black Rot of Cabbage and Cauliflower

Black rot of cabbage (*Xanthomonas campestris*) is a vascular bacterial disease causing dwarfing and rotting of plants or spotting and wilting of leaves.

In recent years heavy losses have been caused in crops, mostly through damage to older leaves, which has necessitated extensive trimming and so spoilt the appearance of the packed crop. In some instances the disease advances to the stage where crops are not worth harvesting.

Symptoms

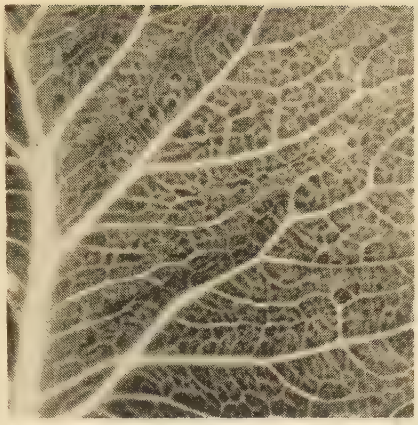
Early symptoms of black rot are yellowing of the foliage and blackening of the veins, beginning at the leaf margin and developing toward the main stem. The whole leaf may become yellow and drop. Affected stems when cut across show a darkened water conducting system. The leaf stalks when cut also show black dots where the bacteria have followed the water vessels. Cauliflower heads become distorted and black lesions may become established on the flower head. Symptoms described above may also be evident.

Spread of Disease

Bacteria are spread by seed, splashing of water, and occasionally by insects.

The disease is more prevalent in periods of prolonged rain. Wounds can be a means of entrance, but the majority of infections probably occur through leaf pores.

Plants should be raised in sterilised soil and sprayed regularly with fungicides, as infection often occurs at this stage. Where black rot is troublesome sprays should be continued after the plants have been planted out into the field.



[*D.S.I.R.*

Portion of cauliflower leaf showing vein clearing.

Tomato Canker Corynebacterium

Tomato canker (*Xanthomonas michiganensis*, Smith Dawson) is present in all tomato growing districts of New Zealand and affects outdoor tomatoes and those grown under glass. Infection is usually confined to a few plants, but occasionally up to 30 per cent of crops are affected.

Symptoms

Infection in young plants often causes wilting, stunting, or death. In older plants the first symptoms are wilting of portion of the lower leaves, which turn brown and die, though they remain attached.

Preventive Measures against Fungi and Bacteria

In spring and early summer rapid new growth needs covering with sprays. Protection of plants from attack rather than attempts to kill the disease after it has become established is the aim.

Applications need to be frequent, because of the rapid growth of foliage, the number needed varying with spring weather according to districts. Where spring rains are not so plentiful, spray applications need not be so frequent.

Fruit setting is reduced and fruit development is poor. The stem shrinks and splits longitudinally. Internally the stems are stained light brown along the infected area.

Tomato fruits sometimes show small, white, rough pustules surrounded by a white halo which persist as the fruit ripens.

Spread of Disease

Tomato canker is transmitted by seed, and on the growing plant it is spread by irrigation or handling during pruning. It can be carried over in the soil by the remains of an infected crop.

Control

Seed should be saved from disease free plants only, and seed pulp should be acid treated. Dry seed of uncertain source should be treated with acidulated mercuric chloride.

Do not plant in an area which has carried an infected crop in the previous three years.

Remove and burn infected plants and do not replace such plants with new ones.

Plants should be sprayed regularly with bordeaux mixture or other copper fungicides to give protection and prevent spread.

VIRUS DISORDERS

Virus diseases, while not producing spores or other visible symptoms of reproduction, can cause severe stunting and distortion of the plant. Obvious field symptoms of virus diseases include:

Mosaic

Mosaic is a term used to denote the light and dark green mottling of foliage which may be seen as various patterns, according to the virus involved and the anatomy of the host plant.

Vein Clearing

Vein clearing is usually a preliminary to the onset of mosaic, and consists of loss of colour along the small veins of leaves.

Necrosis

Necrosis is a common symptom of certain viruses, consisting of the formation of dark spots on the foliage and stem, often with dead tissue at the centres. This is seen on certain potato varieties when infected with potato virus Y. An example of this type of disorder can be seen in spotted wilt of tomatoes.

Distortion of Leaves

Distortion of leaves is a common feature of virus symptoms and often occurs with other symptoms such as leaf mottling. The narrowing of tomato leaves infected with cucumber mosaic virus, leaf rolling in potato crops through the leaf roll potato virus, and crinkling of bean leaves caused by bean mosaic are all examples of leaf distortion.

Spread of Virus Diseases

Most virus diseases are spread by aphids and thrips through their sucking sap from infected plants and then

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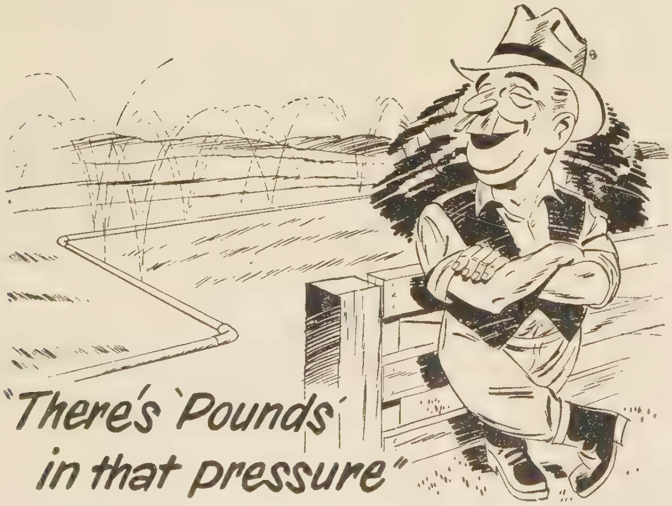
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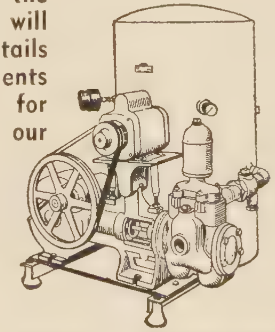

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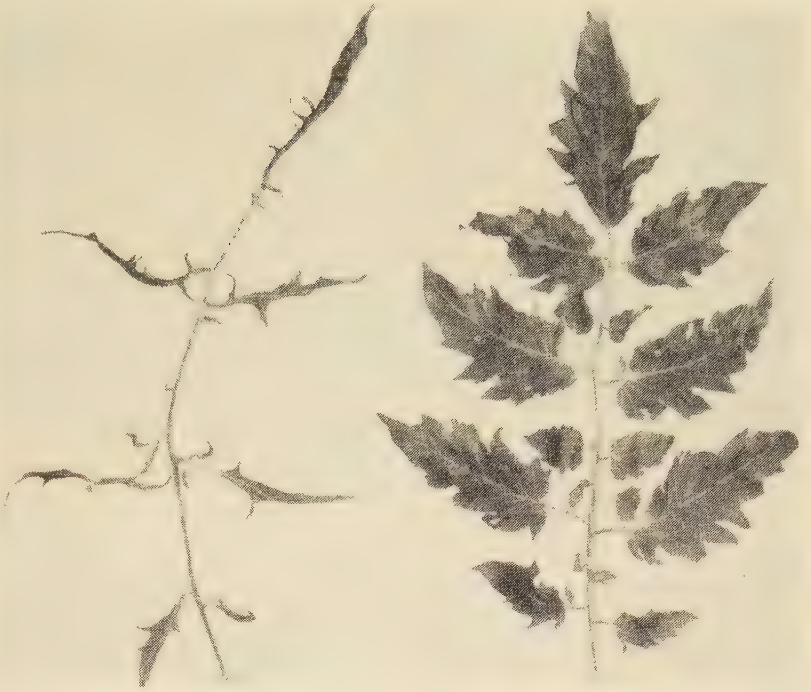
feeding on healthy plants. All crops which are susceptible to virus diseases should therefore be protected by insecticidal sprays. Not all virus diseases are transmitted by such insect carriers. Some, such as tobacco mosaic virus and potato virus, appear to be spread only by inoculum due to infected sap collected by broken plant hairs during cultural operations and transfer to a healthy plant through similar contact. It is advisable to remove any plants showing a virus disorder from a glasshouse. Pruning and training should begin at the furtherest point from the infection so that they will conclude in the area where infection has been discovered.



Tomato leaf on left shows severe symptoms of cucumber mosaic; that on the right is healthy.

Cauliflower Mosaic

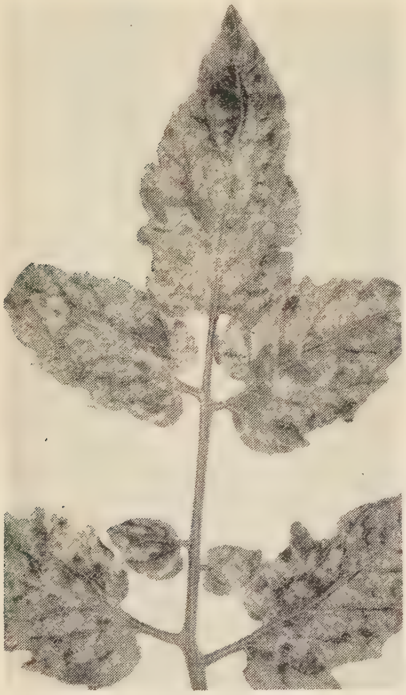
Crop losses from cauliflower mosaic are quite substantial, especially in cauliflower and broccoli. Heads from infected plants remain small and are frequently distorted and unfit for market.

Symptoms

First symptoms are vein clearing, with mottled areas developing between the veins. These are accompanied by severe stunting of the plant, which is more pronounced when infection occurs early in the season. Seedbed infections usually produce very severe stunting.

Spread of Disease

Cauliflower mosaic is spread by aphids which commonly infect crucifers. Susceptible crops carrying the virus are grown throughout the year, and it is thought that in this way the virus is carried by insects into the next season.



Tobacco mosaic on tomato leaf.

Control

Regular spraying with lindane or malathion should be started in the seedbed as soon as plants have become established and must be continued regularly while plants remain there. Rogueing of crops early in the season after plants have been put into the field also helps reduce the spread. Seedbed protection, however, is most important, because while plants are crowded it is much easier for aphids to infect a great number of plants quickly.

Cucumber Mosaic

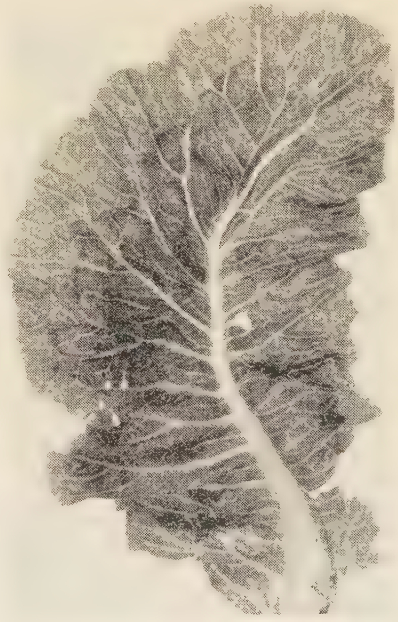
Cucumber mosaic has a wide range of hosts in market garden crops, including cucumber, pumpkin, tomato, carrot, celery, and spinach.

Symptoms

First noticeable symptoms are stunting and mottling of the leaves. The disorder is likely to be more severe when a host plant is infected early. Tomatoes are perhaps the most important vegetable crop affected by this virus. The first indication of infection is a distinct narrowing of young leaves. This may become more pronounced, with distortion and curling of the leaves in severe cases. Upward growth can continue almost unaffected, and leaves formed before infection remain unchanged, but the reduced leaf area generally impairs yield seriously.

Spread of Disease

This virus is readily transmissible though the sap, and where infected plants are present infection is likely to be spread during cultivation. It is also easily transmitted by aphids, and



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Cauliflower leaf showing vein banding, mottling, and bending to one side.

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as the virus is carried by a number of susceptible weeds, it is easily continued from season to season by aphids feeding.

Control

Grow susceptible crops away from flower gardens, inspect crops regularly and remove infected plants, and after handling infected plants wash hands thoroughly with soap and water before handling any healthy ones. Save seed only from healthy plants.

Virus Diseases of Potato

Symptoms

The following is a guide to symptoms of potato plants infected with one or more of the virus diseases:

Leaf roll: The leaves roll inward toward the main vein. This is often accompanied by a thickening and harshness of the leaves, which when shaken rustle. Infected plants are often stunted.

Leaf mottle: Leaf mottle is rather a mild symptom, with slight crinkling of the leaf margins. Infected plants usually show little or no stunting. There is some loss of yield from plants showing this symptom, but not as much as with leaf rolling.

Necrosis: Fine necrotic streaks develop on the veins and undersides of leaves. These spotted areas increase and spread along the vines. The condition can continue until the whole leaf shrivels and hangs on the stem.

Spread of Disease

Two of the potato viruses are spread through crops by insects sucking sap and one through contact. The disorders can be carried over by infected tubers.

Control

Use certified seed tubers.

Remove any plants showing visible symptoms of virus.

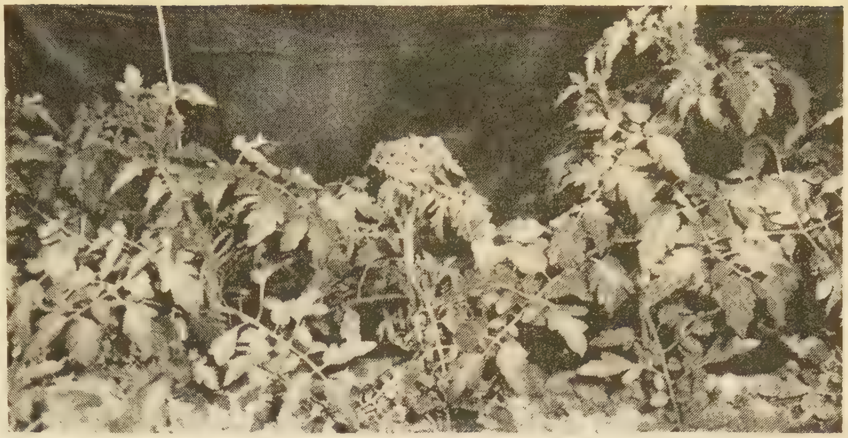
Where aphids are likely, spray regularly with lindane or malathion.

Tomato Spotted Wilt

Tomato spotted wilt, also known as bronze top, was first noticed in New Zealand in tomato crops in the Hutt Valley and in the Manawatu in 1936. The disease has now spread throughout the country and has been identified on a wide host range, including tomato, tobacco, lettuce, garden pea, and many ornamental plants.

Symptoms

The first sign of tomato spotted wilt on tomato plants is bunching of growing points, with a gradual bronzing of the bunched area. Marks which cause the bronzing vary from light brown to black and appear first at the base of the leaves and on the upper leaf surface, but later are found on both sides. This marking increases until many leaves are brown and shrivelled. Dark patches or streaks may also appear on stems and sides of leaf stalks.



Tomato spotted wilt. The centre plant is infected and shows bunching of the growing point.

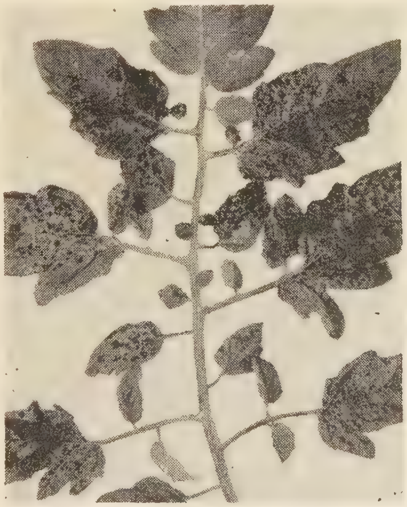
Where infection occurs in young plants, severe stunting and death often occur. If infection takes place before the first truss is set, no fruit develops, but if lower trusses have already set, fruit developing is often affected by bronzing and stunting. Later infection when plants are near maturity does not often affect the growth of the plants, but fruit from such plants is often marked by concentric discoloured areas.

Spread of Disease

Onion thrips transmit tomato spotted wilt in New Zealand. The insect feeds on a wide range of plants and becomes infective during the larval stage. It retains this infectivity during its life.

Control

Keep seedlings away from other plants which may carry infection.



Symptoms of spotted wilt on tomato leaf, showing necrotic spotting, which produces a bronzing of foliage.

Do not have a seedling nursery near ornamental flower beds.

When plants are set out in the field, they should be inspected weekly for the first month and any infected plants detected should be destroyed.

Pea Mosaic

Pea mosaic is one of the most widely known virus diseases of vegetables in New Zealand.

Symptoms

Vein clearing in young leaves is an early symptom of pea mosaic in garden and field peas. As the disease progresses mottling in which light coloured areas occur in the spaces between the veins becomes more general. Mosaic infected plants are stunted and pale, with smaller leaves than healthy plants. Plants showing this disorder produce fewer pods than healthy plants, and pods are poorly filled. Infection can occur at any stage of growth, but only leaves formed after infection show symptoms.

Spread of Disease

The natural spread of pea mosaic in New Zealand is mainly by the green peach and potato aphids. The virus over-winters on red clover and other susceptible clovers, broad beans, and in the corms of gladioli.

Control

Where large areas of peas are grown, headlands should be kept free of weeds.

For canning or local market, varieties resistant to pea mosaic can be grown. Information on these is obtainable from Horticultural advisory officers of the Department.

In the home garden gladioli are the most dangerous source of infection, and pea crops should not be grown near them. Gladioli should be regularly sprayed with lindane or malathion to control aphids and reduce the possibility of infection.

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SOWING AND PLANTING

Successional sowings:

Dwarf beans, beetroot, carrots, celeriac, Chinese cabbages, kohl rabi (where ground is not likely to dry out), lettuce, mustard and cress, mustard greens, New Zealand spinach, radishes, silver beet, onions for salads, turnips, tampala, peas, swedes.

Seedlings or tubers which can be set out:

Celery, self-blanching and the newer green types, lettuce, where conditions are not too hot and dry for transplanting, summer cabbage, cauliflower.

Winter greens (except in mild northern districts), such as broccoli or winter cauliflower and savoy cabbage (several varieties of each to ensure succession), brussels sprouts, kale or borecole, leeks, cabbage for pickling.

A small planting of early maturing potatoes can be made in districts having a mild autumn and where ground is likely to remain moist enough for good growth to provide new potatoes in late autumn or early winter.

The Home Garden in January

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

IN January soil and air temperatures usually favour vigorous garden growth and in most districts soil moisture is usually more satisfactory than in February or March. In many districts January provides the last opportunity for sowing peas, dwarf beans, carrots, beetroot, and swedes to mature before winter. Spinach, silver beet, turnips, radishes, lettuces, onions for salad, and parsley may be sown now, or where conditions are likely to remain favourable the sowing may be deferred until February. Continuity of supply should be the aim of every home gardener, and failure to plant winter greens during December or January may in many districts result in a break in continuity of supply during winter or early spring.

USUALLY it is difficult in small gardens to find space to make summer sowings and winter plantings as well, because by mid-January most home gardens are fully planted with such vegetables as dwarf and climbing beans, carrots, potatoes, shallots, peas, spinach, onions turnips lettuces, radishes, and various kinds of beet, all of which are easily grown for harvesting at this time. Pumpkins, marrows, cucumbers, tomatoes, and sweet corn should also be ready toward the end of the month in most districts.

Where seedlings of savoy cabbages, broccoli or winter cauliflowers, curly kale, brussels sprouts, and leeks have not yet been set out, a selection to provide supplies from late autumn until the new season's crops have matured in late spring should be planted now in all except the most favoured districts.

Staked tomatoes should be pruned regularly and tied up as they develop. In the more humid districts plants should be sprayed with a fungicide such as copper oxychloride or zineb (combined, where caterpillars are troublesome, with DDT or lindane). The earliest outdoor tomatoes usually ripen in January. Tomatoes should be picked as they ripen, but before they become soft. This will avoid damage by birds and encourage later fruits to develop.

Members of the cabbage family, including swedes, turnips, and kohl rabi, should be dusted or sprayed where necessary with DDT to give protection against caterpillars or sprayed with malathion or lindane to kill aphids.

Kumaras should be lifted periodically to prevent them from rooting. The vines will not then mat together and are much easier to turn. In some seasons kumaras will succeed in warm, sheltered areas as far south as Christchurch.

Celery should be sprayed with captan or a substitute even before leaf spot appears. The first or a successional crop of celery should be planted in trenches or set out in beds. The bed method is simpler, but rows should be restricted to about four for easy working. Plants should be set out in rows 6 to 8 in. apart and the plants spaced 6 to 8 in. in the rows. By alternating the plants in adjoining rows these spacings should be satisfactory. Celery should be given adequate water and manure. Green varieties are now becoming more popular because of their

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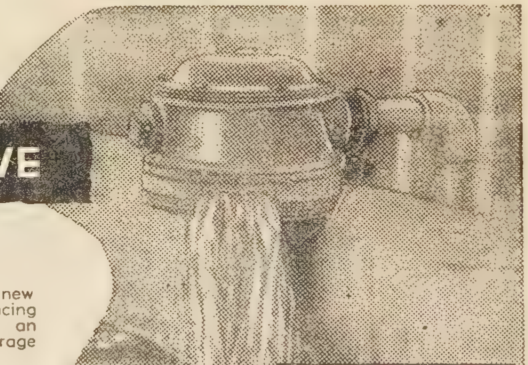

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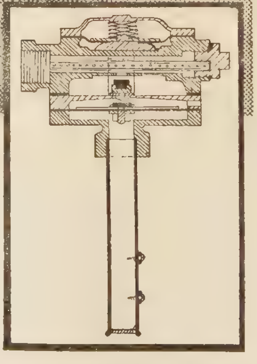

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Ground that will not be required for some time should be sown with a cover crop such as lupins, mustard, barley, or oats. Plant foods are then less likely to be leached out of the soil and its organic content can be built up. The hoe should be kept sharp and used often and vigorously in January to destroy weeds, which are easily killed in the comparatively dry conditions which are usual then.

Pumpkins and similar trailing plants should have their end shoots pinched out to induce the growth of fruiting laterals. They should be ready for harvesting during January in most districts. Marrows should be cut as they mature. Cucumbers should be harvested when slightly immature, as their flavour is best then.

In the more humid districts potatoes should be sprayed with bordeaux mixture, copper oxychloride, or zineb for protection against late blight. The tubers should be kept well covered by moulding the soil to as sharp a ridge as possible to shed spores of late blight which may fall from affected leaves.

Carrots, beetroot, turnips, peas, dwarf beans, and silver beet and spinach beet can still be sown in most districts, though early sowing is advisable in southern districts. Spinach may be sown if a suitable long-standing variety is chosen, though as an alternative for hot, dry conditions tampala or New Zealand spinach does well.

Seedlings should be thinned as soon as possible after germination. This is best done after rain or after the ground has been well watered. In wet soil seedlings can be more readily removed without disturbing neighbouring plants. Thinning in dry conditions may cause the death of many remaining plants.

Onions

If thrips are troublesome on onion crops that will not be mature for some time, the plants should be sprayed with lindane or malathion, and if mildew is restricting growth, they should be sprayed fortnightly with copper oxychloride or zineb, plus a wetter. In many districts onions mature toward the end of January. Correct harvesting has an important bearing on keeping qualities. The most suitable time for harvesting should be determined by factors such as the weather, the condition of the crop, and whether onions are for fairly immediate use or for long keeping.

If bulbs are to be used almost immediately, they should be lifted as required when they have reached maximum or almost maximum growth. Onions for long keeping should preferably be cured, and in this condition the roots and tops should be dried off and the bulbs should be so hard that they are not readily dented by the thumb.

Readiness of onions for harvesting is indicated by drooping of the tops just above the bulbs while the leaves are still green. Gradual dying back from the tops of the leaves while the necks remain rigid, erect, and thick is an indication of abnormal ripening and such onions usually do not keep well. Insect pests or a poor strain of plant may be responsible. There is likely to be a percentage of this type in practically all crops.

The roots of healthy, well grown onions ready or nearly ready for harvesting lose their hold on the ground as they gradually die and the necks of the stems soften owing to the transference of the soluble solids of the leaves into the bulbs, until the outer succulent layers of the bulb nearly close the opening on the inner scales. After the necks shrivel the leaves gradually turn yellow and dry off, even if the onion is not harvested.

If onion bulbs dry off prematurely, the necks of the bulbs may remain open and allow various rot organisms to enter. Premature drying off of the bulbs may be due to injury by heavy infestations of thrips or by damage to the roots by hoeing. Growers sometimes hoe off the roots to cause premature death of the leaves and thus speed the drying off of the crops so that harvesting can proceed.

Except in a few areas conditions in New Zealand are rarely ideal for harvesting and curing onions and it may not be possible to wait until the crop reaches the best stage for harvesting. Early frost is a risk in some districts. Light frosts do not harm onions, but heavy frost may cause severe injury.

Onions with thick necks or that have not closed at the necks or bulbs left to dry that have been exposed to showers or to heavy dews are likely to rot or take root again. Where conditions for drying are not likely to be suitable onions should be dried or cured under cover.

Drying or curing usually takes three to four weeks. In districts where a spell of fine weather is likely bulbs can be left on the ground. The tops should be left on to give them some protection from the sun. If rain falls or there are heavy dews, bulbs should be turned to enable them to dry evenly and to check rots, sprouting, or discolouration by the wet soil. After drying it is usual, though not essential, to top the onions by cutting or twisting the tops ¾ in. from the bulbs. Twisting is preferable, as it closes the tops of the bulbs and the twisted leaves act as a barrier to the entry of rotting organisms. Alternatively the bulbs can simply be gathered when dry and packed in open-mesh bags or in shallow open boxes.

Meteorological Records for October

Station	Height of station above M.S.L. (ft)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	59.4	+2.6	74.0	39.4	2.65	8	—2.1	0.74	29	174
Auckland	160	60.0	+2.6	71.6	46.8	5.48	8	+1.3	2.23	27	206
Tauranga	12	57.8	+1.8	74.2	39.6	1.71	7	—2.9	0.62	28	232
Ruakura	131	56.1	+1.8	74.1	37.2	4.40	10	+0.1	2.38	28	183
Whakarewarewa	1,006	56.3	+3.3	80.3	32.4	3.76	8	—1.5	1.01	16	201
Gisborne	14	58.0	+2.5	86.6	39.0	0.79	6	—1.8	0.22	29, 31	264
New Plymouth	160	57.0	+2.6	68.9	42.6	1.82	6	—4.0	0.64	28	187
Karioi	2,125	52.4	+4.2	76.7	28.5	1.51	8	—3.0	0.65	28	—
Napier	5	59.4	+2.9	88.4	37.0	0.54	5	—1.4	0.31	28	278
Wanganui	72	57.8	+3.0	75.8	38.2	0.51	4	—2.7	0.16	2	227
Palmerston North	110	57.1	+3.2	76.5	34.2	0.72	9	—3.1	0.35	28	172
Waingawa	340	56.8	+4.1	79.0	30.5	0.23	3	—2.9	0.21	16	269
Wellington	415	56 8	+4.0	70.9	38 8	0.77	6	—4.0	0.46	14	228
Nelson airfield	5	56.0	+3.8	80.4	36.6	1.39	4	—2.2	1.00	27	249
Blenheim	14	58.8	+5.1	86.2	34.0	0.09	2	—2.4	0.08	27	288
Hanmer Forest	1,270	56.4	+5.8	79.0	30.5	0.17	2	—4.1	0.12	6	259
Hokitika South	15	54.3	+3.3	64.0	38.5	7.36	16	—3.5	3.19	27	136
Christchurch	22	58.8	+5.7	81.8	35.5	0.09	1	—1.9	0.09	10	214
Ashburton	323	58.6	+6.2	82.6	34.6	0.33	4	—1.9	0.24	10	196
Timaru	56	56.5	+3.8	78.4	35.8	0.53	5	—1.6	0.18	31	176
Alexandra	520	57.2	+4.8	79.4	32.2	0.36	3	—0.8	0.17	28	205
Taieri	80	54.6	+3.5	78 0	29.2	1.39	7	—1.1	0.67	16	171
Invercargill airfield	0	52.8	+3.8	67.8	29.6	3.02	15	—0.4	0.84	15	152
Chatham Island	150	51.0	+1.1	60.9	38.4	0.45	9	—1.5	0.18	29	131

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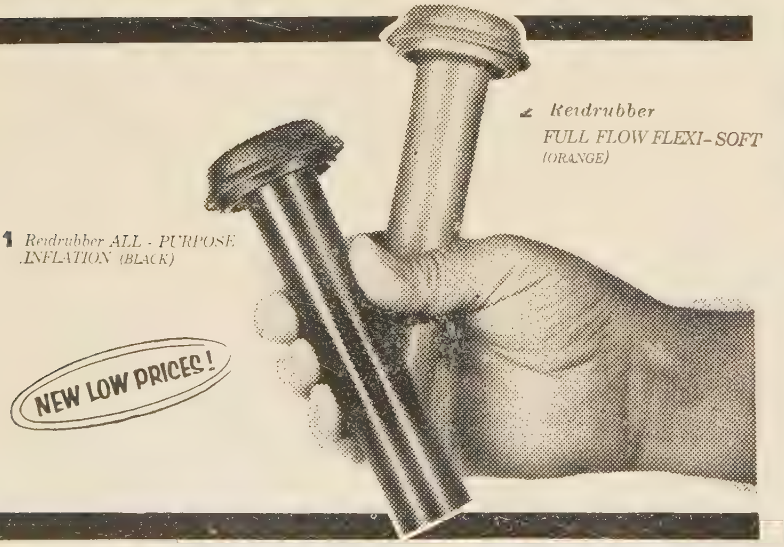
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The Business Side of Farming

Standardisation of Farm Accounts

By R. H. SCOTT,
Chief Advisory Officer
(Farm Economics),
Department of Agriculture,
Wellington

DURING times of farming prosperity the attainment of maximum efficiency on farms does not always assume great importance, research and advisory services then being geared frequently to the technical problems associated with achieving high physical output. With a less favourable economic climate, efficiency measured in economic terms assumes greater importance.

TO obtain an indication of the economic efficiency of farms the use of records is necessary, but unless they are kept in such a way that adequate physical and financial information can be disclosed in the annual accounts for a farm enterprise, these accounts are of use for little else than perhaps meeting the minimum requirements of the Inland Revenue Department.

At the 1959 Seminar on Applied Accounting, conducted by the Department of Accountancy at Victoria University of Wellington, papers presented at a session on Farm Accounting showed the need for research in this field. After the seminar the Accounting Practice and Procedure Committee of the New Zealand Society of Accountants decided to sponsor research in farm accounting. A committee was set up comprising public accountants and representatives from the Society of Accountants, the University, producer boards, and interested Government Departments, and the report of this committee has been completed. While it is not anticipated that all accountants will immediately adopt the recommendations of the committee, a number are likely to.

Farmers can hasten the change by requesting their accountants to prepare annual accounts in line with the recommendations. However, in this farmers have some obligations, as they will have to keep appropriate records to enable accountants to compile more informative annual accounts, which it is hoped will be the pattern in the future. If this is done, accounts can be of use in the management of a farm as they are in the management of many other enterprises.

There are now good farm diaries available and provision is made in them to record most of the physical information for a farm. This information can be of considerable assistance to an accountant in compiling a farmer client's annual accounts.

Some of the matters considered by the committee can be looked at in relation to the annual accounts and statements which should be prepared.

The Balance Sheet

While showing the liabilities of a farm business, the balance sheet frequently does not give the present value of the assets of the enterprise. Where a farmer is seeking credit, a statement giving the present net worth of an enterprise is of considerable use, and it is therefore an advantage to have sufficient information in the annual accounts and supporting statements to enable a realistic net worth statement to be quickly reconstructed. To assist in the compilation of such a statement it is now recommended that the latest Government valuation of a farm and its date be inserted at the foot of farm balance sheets.

Accompanying the balance sheet there should also be a schedule of the plant and implements on the farm. While the values placed on the equipment will be "book" values, and thus not bear a close relationship to present values, it is relatively easy with the list and a knowledge of the equipment to place a more realistic value on the individual items.

Separate Income Accounts

The committee endorsed the generally accepted practice of maintaining a separate account for each individual type of major farming activity so that the gross profit arising from that activity is readily apparent in the accounts.

Some suggestions for the main accounts are:

1. Beef Cattle Account

(a) Accompanying the account on a separate schedule there should be an adequate division of beef stock into classes at the beginning and end of the accounting period. Purchases and sales should also be set out in the schedule in the same way. The division which the Department of Agriculture tries to obtain in its farm management recording scheme is:

Female Stock

Heifers rising 1 year
Heifers rising 2 years
Breeding cows up to 8 years
Breeding cows over 8 years
Cows (dry)

Male Stock

Steers rising 1 year
Steers rising 2 years
Bullocks
Bulls

(b) Where fat cattle are sold to works, the weight for each lot of cattle sold should be included in the schedule.

(c) The account should form a reconciliation of stock numbers for the accounting period by including the number of calves marked, the number of deaths or missing, and any stock killed on the farm.

2. Dairy Cattle Account

(a) In this account the number and class of dairy cattle on hand at the beginning and end of the year by classes should be shown. The division which the Department uses is:

Heifers rising 1 year
Heifers rising 2 years
Milking cows
Bulls

(b) Purchases and sales should be shown by classes, except that the number of bobby calves sold should be shown separately.

(c) The account should form a reconciliation of dairy cattle

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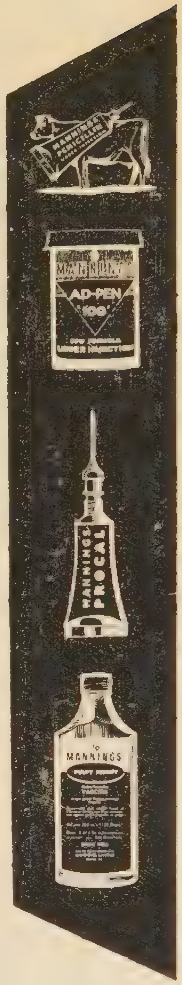

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numbers for the accounting period by including deaths by classes and number of calves retained.

3. Dairy Produce Account

(a) Besides showing the gross proceeds from the sale of butterfat or milk, the weight or quantity sold should also be shown.

(b) At the foot of the account the number of cows actually in milk on 15 January should be shown as well as the average butterfat production per cow and per acre.

4. Sheep Account

(a) Accompanying the account in a separate schedule there should be an adequate division of sheep into classes at the beginning and end of the accounting period. Purchases and sales should also be set out in the schedule in the same way. The division used by the Department is as follows:

Ewe hoggets
Two-tooth ewes
Other ewes
Dry ewes
Wether hoggets
Two-tooth wethers
Four-tooth wethers and over
Rams

(b) For sales of fat stock to works the weights of drafts should be shown in the schedule.

(c) The account should form a reconciliation of sheep numbers for the accounting period by including the number of lambs tailed, the number of deaths and missing, and the number killed for use on the farm.

(d) At the foot of the account the number of ewes used for breeding should be shown; that is, the number of ewes mated plus purchases of in-lamb ewes.

5. Wool and Skin Account

(a) The account should show the weight of wool on hand at the beginning and end of the accounting period.

(b) Besides the proceeds from the sale of wool, the total weight of wool should be shown.

(c) At the foot of the account the weight of the wool produced per acre can be shown.

6. Cash Crop Account

(a) The account should show details of value and quantity of pasture, grain, and pulse seeds on hand at the beginning and end of the year.

(b) The account should show the quantity and value of grain, pulse, and pasture seeds sold during the year.

(c) At the foot of the account or on a separate schedule the acreage of each class of crop harvested and the aggregate yield of each crop should be shown.

In the individual livestock accounts livestock are shown at standard values, which are usually lower than current market values. By supplying an adequate division of livestock in these accounts or accompanying schedules it is relatively easy to place more realistic values on the stock. This facilitates the preparation of an up-to-date net worth statement of the farm enterprise where this is necessary.

It is realised that unless farmers keep adequate livestock records as can be done in a modern farm diary it will not be possible for their accountants to include a division of livestock as suggested.

Farm Working Account

From the management point of view this is an important account. For some time people servicing farmers have advocated the need for a standard division of farm expenditure, and the committee gave considerable thought to this matter. The Department has also considered it and in its farm management recording scheme a standard division has been adopted which is practically in line with that suggested by the committee. The expenditure headings used by the Department and the content of each heading are:

1. OPERATING EXPENSES

Administration

Accountancy fees; bank charges; dog licences; newspapers and farming publications; postages; printing and stationery; rural delivery fee; telephone and toll charges; travelling expenses (not private or car expenses); subscriptions; annual fees for farm improvement clubs.

Animal Health

Dusts and dips; foot rot fluid; vaccinations; drenches; veterinary fees; stock licks; covers; dehorning; subscriptions to veterinary clubs; blowfly control; calciferol; cobalt pellets; testing rams; bloat control; lambing aids.

Breeding Expenses

Artificial breeding; herd testing; service fees.

Crop Harvesting

Contract harvesting; sacks and twine; stack covers (polythene); seed dressing and certification charges; potato harvesting; grading.

Cultivation Contracts

Contract charges such as for giant discing, ploughing, working up and sowing down; and overdrilling.

Dairy Shed Expenses

Cleaning materials; inflations; vacuum pump oil; brushes; brooms; leg ropes; electric light bulbs.

Electricity and Fuel

Power and fuel for dairy shed, shearing shed, irrigation plant, and stationary engines.

Fodder

Proprietary stock foods; contract hay baling; winter feed bought; fodder crops bought; grazing bought; lucerne cake; brewers' grains; pea silage; bran and pollard; purchase of water for livestock.

Fertiliser and Lime

Fertiliser and lime; freight and spreading costs; aerial spreading costs; soil testing.

Freight

Cartage or railage on all farm goods both inward and outward but to exclude freight on fertiliser and lime; charges for milk tanker collection.

Fuel and Oil (tractors, trucks, cars, etc.)

Fuel and oil for tractors, truck and car, and for other farm machinery such as header harvesters, less petrol rebate; rent of petrol tank.

Piggery Expenses

Pig foods; rings.

Repairs and Maintenance

(a) Tractors, trucks, and cars; registration and insurances for these.

(b) Plant and machinery (other than vehicles), including tools and hardware, ropes, handpieces for shearing machine.

(c) Fences and shelter; repairs to fences; gates and yards; trimming of live hedges and shelter belts.

(d) Buildings and fixtures (quarter share of maintenance of dwelling occupied by owner is chargeable to farm); maintenance and repairs to tracks, roads, dams, water pipes, troughs, tanks, irrigation and stock water races, and drains.

Seeds

Cash crops, fodder crops; pasture; inoculants.

Wages

Wages of manager; permanent labour; shearing; special (state scrub cutting, etc.); keep of employees.

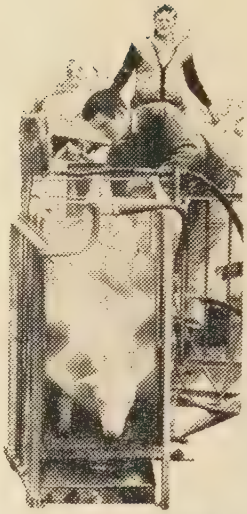
Weed and Pest Control

Spray; cost of application (including contractor's charges).

Woolshed and Flock Expenses

Branding fluid; woolpacks; combs and cutters; emery paper; machine cores; twine and needles; shearing oil; raddle; docking rings; crooks; ear tags; flock registration.

GREAT, NEW
2-IN-1 INSECTICIDE
1. Gets rid of lice & ked
2. Beats blowfly



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NEW EFFECTIVENESS AGAINST LICE AND KED
'VETAMAC' is selectively absorbed by the wool grease and diffuses along the whole length of the fibre. At normal tip spray strength 'VETAMAC' remains in the wool long enough to kill hatching louse eggs and ked larvae and thus gives maximum kill. Residual strength of 'VETAMAC' is sufficient to impregnate new wool growth.

NEW CONTROL OF BLOWFLIES
'VETAMAC' gives prolonged protection against flystrike. Stronger solutions may safely be used when longer-than-normal protection is needed. 'VETAMAC', being an entirely new insecticide, is completely effective against all types of blowflies found in New Zealand, including those resistant to other insecticides. 'VETAMAC' is equally effective against breech, body or poll strike. 'VETAMAC' mixes easily, will not clog spray or jetting pieces.

TESTED BY RESEARCH
'VETAMAC's' effectiveness and safety have been well established in U.S.A. in practical work over many thousands of sheep. However, before releasing the product in New Zealand, Nicholas carried out extensive trials in New Zealand and Australia to satisfy themselves that the product acts similarly under our conditions. Results have been extremely satisfying; highly effective; easy and safe to use.

NEW FEATURES OF 'VETAMAC'
- Controls and eradicates lice and ked
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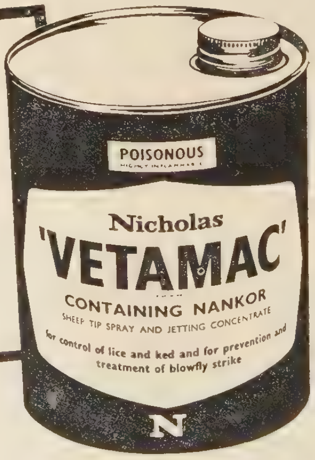
- Controls blowfly larvae resistant to other chemicals
- Effective against body, breech or poll strike
- Safe to humans and all livestock, dogs and other domestic animals when used as recommended
- Most economic spray available
- May be used in tip sprays or by jetting.


POISONOUS
Nicholas
'VETAMAC'
CONTAINING NANKOR
SHEEP TIP SPRAY AND JETTING CONCENTRATE
for control of lice and ked and for prevention and treatment of blowfly strike
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A Nicholas **N** Product

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NICHOLAS PRODUCTS LTD., 15 Marion Street, Wellington. 5180

General

Expenditure such as commission and selling charges which cannot be allocated to any other item. It is desirable to keep the item as low as possible.

2. OVERHEAD EXPENSES

Insurance

Insurance premiums but excluding personal and life insurance and insurance on motor vehicles.

Land Tax

As paid.

Rates

Rates on land; water rates and charges; irrigation rates and charges.

3. DEVELOPMENT CHARGES

Any costs which can be reasonably charged and allocated to the development of the farm.

4. FINANCIAL CHARGES

Interest

Interest incurred on loans from State Advances, stock firms, banks, etc.; includes legal expenses incurred in borrowing new loan moneys to be used in the production of farm income and expenses incurred in the renewal of mortgages.

Rent

Rent on a leasehold property; includes legal expenses incurred in renewing a lease. This item is not to include rent for grazing (see under fodder).

5. DEPRECIATION

Depreciation is assessed at rates laid down by the Inland Revenue Department.

Balance Date

The committee accepted 30 June as a general balance date for most classes of farming in New Zealand.

The orthodox New Zealand financial year—1 April of one year to 31 March of the next year—is unrealistic, particularly in livestock farming. At 31 March the dairy farmer usually has some cows in milk and many sheep farmers still have wool on hand and perhaps fat lambs and cull sheep for sale. In short, the annual cycle of farming operations is incomplete. On the other hand, at 30 June the dairy herd is dried off and the sheep farmer's breeding stock is stable in numbers and being managed ready for lambing and the start of a new season.

The article gives only a brief outline of the material which the research committee considers should be included in farm accounts. The committee's report is expected to be published early in 1962 and it is hoped that a start will be made by some accountants to adopt the recommendations when preparing farm accounts for the 1962-63 farming year. However, accounts prepared on these lines are not on their own a great help in the management process. They need to be compared with data for somewhat similar types of farms which are well managed.

In a further article a short account will be given of the Department of Agriculture's farm management recording scheme, under which physical and financial data are being collected each year from groups of farms in a number of districts in the Dominion. The economy of other similar farms in these districts where the accounts include information on the lines suggested can be compared with the data being collected under the scheme.

◆

Freedom-from-Hunger Campaign

PRIMITIVE hand tools used in many underdeveloped countries limit the increase of food production. Animal-drawn implements are seldom used in these countries and those which have been introduced have usually been imported at high cost. These countries, however, generally have an abundance of cheap labour and if local skills were utilised on a large scale, better hand tools and simple animal-drawn machines could be manufactured locally. This would not only contribute significantly to increased agricultural production, but would keep costs down.

To help achieve this aim the Food and Agriculture Organisation of United Nations sent a small tools specialist to give demonstrations in various countries. The illustration shows a young Ethiopian farmer learning how to sharpen a scythe.

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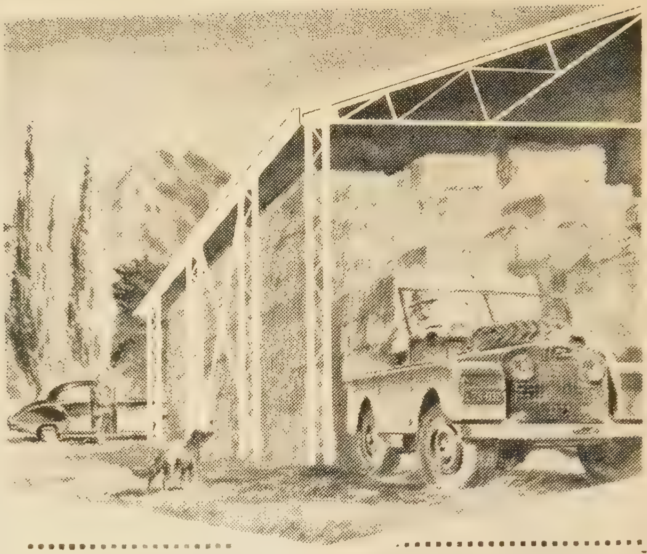

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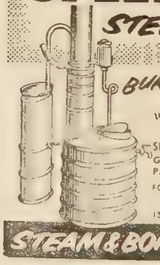

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SUBSCRIPTION RENEWALS

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Town Supply Herds Certified Clear of Reactors to Tuberculin Test

DURING September the following town milk suppliers were issued by the Department of Agriculture with clear herd certificates declaring that their herds are free of reactors to a tuberculin test.

To qualify for a clear herd certificate a supplier's herd must have no reactors to a tuberculin test of the whole herd. A herd comprises all cattle over six months of age depastured or kept on one property and includes dry or other stock from the property temporarily on a run-off. Where two or more herds share a common run-off all the herds using it have to be tested before any of them can qualify for clear herd certification.

In the list below the figures after each supplier's name and address are the number of the animals tested and these are followed by the date of the test.

These herds will be recorded in the New Zealand Register of Clear Herds, compiled by the Department.

AITKEN, L. H., 1 R.D., Outram, 64, 4/9/61
BAIKIE, G., 4 R.D., Rosewill, Timaru, 107, 18/9/61
BAIN, A. L., Woodside, 1 R.D., Outram, 135, 12/9/61
BAIRD, R. J., 237 Prestons Rd., Christchurch, 29, 5/9/61
BARNES, D. F., P.O. Box 36, Norsewood, 39, 18/9/61
BAVERSTOCK, C., Baverstock Rd., East Tamaki, 32, 19/9/61
BELL, C. W., and SNELL, O. C., Coatesville, 3 R.D., Albany, 189, 22/8/61
BELL, D. J., Battys Rd., Fairhall, Blenheim, 42, 12/9/61
BEVERIDGE, J. R., 4 R.D., Waitarere, Levin, 72, 25/9/61
BISSET, J., Hacketts Rd., Momona, 40, 18/9/61
BLACK, G. R., Muriwai, Gisborne, 130, 4/9/61
BOOTH, J. C., Huntley Rd., R.D., Outram, 38, 28/8/61
BOURKE, J. L., Boddytown, Greymouth, 17, 12/9/61
BOWATER, C. N., Wharepapa, 161, 18/9/61
BRADBURY, W. H., Box 107, Otaki Railway, 125, 5/9/61
BRASS, G. K., R.D., Woodside, Taieri, 69, 4/9/61
BRAWN, C. H., Speddings Rd., Kumeu, 71, 4/9/61
BURGESS, T., Mangaroa, 76, 3/9/61
BURNSIDE, T. A., Ardmore, 59, 12/9/61
BUTLER, I. R., 3H R.D., Oamaru, 14, 19/9/61
CAMERON, A. J., Est. of, 1 R.D., Outram, 66, 18/9/61
CANDY, T. J. and N. W., R.D., Ohau, 275, 18/9/61
CARSON, J. W., Eddistone St., Kaitangata, 23, 25/9/61
CARTER, T. E., Scruttons Rd., Heathcote, 40, 27/8/61
CATLEY, W. H., Est. of, Box 9, Te Horo, 59, 5/9/61
CHUBB, K. D., 7 R.D., Te Puke, 83, 28/8/61
CLAVERTON FARM LTD., c/o F. W. Franklin, Basil Rd., Taradale, 88, 1/9/61
CLELAND, G. M., Beach Rd., Te Horo, 50, 18/9/61
CLOKE, S. C., Wortley Rd., Lepperton, 85, 29/8/61
COLEMAN, J. E., Ohura, 110, 4/8/61
CORNES, W. J., Chapel Rd., East Tamaki, 48, 19/9/61
CRAMPTON, R. W., 1 R.D., Hamilton, 36, 31/8/61
CROAD, R. H., Waiohanga Rd., R.D., Te Horo, 129, 2/9/61
CROWLEY, J. J., Maxwell, 123, 25/9/61
DAIRY RESEARCH INSTITUTE, Massey College P.O., Palmerston North, 86, 28/2/61
DeRENZY, A. R., Ohape, R.D., Geraldine, 74, 12/9/61
DITTMER, W. H. M., Otaki, 77, 18/9/61
DORNE, G. W., Box 19, Otaki Railway, 51, 5/9/61
DUDER, J., Turiwiri, R.D., Dargaville, 80, 12/9/61
DUGUID, W., Buller Rd., Levin, 65, 4/9/61
DULIEU BROS., Greenpark, 4 R.D., Christchurch, 68, 5/9/61
DUNCAN, J. R., and SONS, Ladbrooks, 4 R.D. (Ladbrooks Property), Christchurch, 59, 11/8/61
DUNCAN, J. R., and SONS, Ladbrooks, 4 R.D. (Lincoln Property), Christchurch, 87, 23/5/61
EATON, F. V., Motukarara, 2 R.D., Christchurch, 42, 19/9/61
EGGLESTON BROS., Greenpark, 4 R.D., Christchurch, 182, 2/9/61
FABISH, M. F., Dudley Rd., Inglewood, 59, 4/9/61
FERGUSON, K. J. I., Flat Bush Rd., Papatoetoe, 81, 11/9/61
FOSTER, J. A., and SON, Ladbrooks, 4 R.D., Christchurch, 87, 1/9/61
GIMBLETT, W. H., Kiritaki, R.D., Dannevirke, 228, 22/9/61
GORDON, D. and D., 1 R.D., Outram, 87, 23/6/61
GORDON ESTATES, Neill Rd., Eltham, 70, 18/9/61
GRAEME FINLAYSON, 6 R.D., Whangarei, 192, 19/9/61
GRASSLANDS DIVISION, D.S.I.R., Palmerston North, 8, 28/2/61
GRIMSEY, C. O., 118 Stanley Rd., Te Aroha, 30, 18/9/61
GUNDERSON, W. S., Murphy's Line, Featherston, 109, 11/9/61
GUY, G. W., Guy's Rd., East Tamaki, 85, 25/9/61
HAMMOND, Mrs M. E., 28 Dyers Rd., Christchurch, 40, 24/8/61
HENDERSON, L. E., 9 R.D., Otatara, 47, 19/9/61
HENRY, S. T., Gladstone Rd., Levin, 58, 12/9/61
HERD and HELLEWELL, 10 R.D., Waimate, 63, 19/9/61
HERON, W. L., Horrelville, R.D., Rangiora, 35, 18/9/61
HEWSON, J. M., Seadown, R.D., Timaru, 48, 12/9/61
HINDS, R. and E., East Rd., Clevedon, 62, 12/9/61
HOBILL, J., Druces Rd., Wiri, Manurewa, 54, 21/8/61
HOGG, J. H. J., Ohau, 82, 26/9/61
HOGG, R. E. J., Ohau West Rd., Ohau, 86, 26/9/61
HOPE, W. R., Waikite Valley, 1 R.D., Rotorua, 107, 18/9/61
HUDSON, R. H. D., Springston, 4 R.D., Christchurch, 102, 19/9/61
HUMM, R. G., Taitapu, 2 R.D., Christchurch, 75, 19/9/61
HUNT, L., Muirs Rd., 1 R.D., Papakura, 33, 29/8/61
ISBISTER, D. M., 1 A.D., R.D., Oamaru, 75, 19/9/61
JENSEN, H., 82 Cuba St., Palmerston North, 119, 11/9/61
JENSEN, M. G., Okaihau, 127, 11/9/61
JOHNSTON, E. E., Bruces Rd., Momona, 61, 25/9/61
JOHNSTON, R. C., Cameron Rd., Wanganui, 41, 25/9/61
KERN, C. T., LTD., R.D., Runciman, 96, 18/8/61
KIRK, W., Mill Rd., Waimate, 117, 19/9/61
KYLE, B. S., Box 57, Otaki Railway, 132, 20/9/61
LAWN BROS., 1 R.D., Whakatane, 217, 12/9/61
LAWRY, S. S., Beach Rd., Te Horo, 98, 11/9/61
LEAMING, Mrs B., Waiau Pa, R.D., Patumahoe, 86, 14/8/61
LEARY, L. P. and D. L., P.O. Box 2505, Auckland, C1, 88, 7/9/61
Le LIEVRE, G. A. E., Takamatua, R.D., Akaroa, 44, 15/9/61
LEPPERTON FARMS LTD., 32 Manutahi Rd., Lepperton, 209, 12/9/61
LINDSAY, K. W., P.O. Box 124, Upper Hutt, 135, 8/9/61
LITCHFIELD, N. F. and A., Waiau Pa, R.D., Patumahoe, 190, 29/8/61
LUTZ, C. E., Box 12, Otaki Railway, 126, 4/9/61
McCARTHY, E. E., Whitemans Valley, Upper Hutt, 86, 25/9/61
McCRACKEN, L., and SONS, 2 R.D., Clevedon, 149, 18/9/61
McDONALD, W. G. and J., East Tamaki Rd., Papatoetoe, 96, 19/9/61
McGREGOR, J. T., Kakanui, 25, 18/9/61
McKEE, G. B., Mountain Rd., Lepperton, 51, 13/9/61
MacLAINE, K. D., Four River Plain, Murchison, 62, 12/9/61
McLEAN, G. C., P.O. Box 35, Paraparaumu, 189, 18/9/61
MAIRE, J. J., Riverside Road, Orewa, 127, 19/9/61
MASSEY COLLEGE, Massey College P.O., Palmerston North, 319, 28/2/61
MATHER, E. and A., Main Rd., Manakau, 111, 28/8/61
MORGAN, R. A. G., Whitemans Valley, Upper Hutt, 109, 11/9/61
MILES, A. J. and G. M., Boxall Rd., Invercargill, 15, 18/9/61
MILLEN, C. N., Massey Rd., 2 R.D., Albany, 43, 9/9/61
MORRISON, A. W., Fairhall, Blenheim, 79, 5/9/61
MOSLEY, W. I., and SON, c/o Post Office, Stirling, 146, 13/6/61
MURRAY, W. M., and SON, Box 11, Ashburton, 53, 11/9/61
NIELSON, J. G., Makara Rd., Karori, 44, 30/7/61
NORTH, H., Omimi, R.D., Waikouaiti, 185, 12/9/61
O'CALLAGHAN, M. B., Silverdale, 59, 15/9/61
O'CONNOR, T. A., Henley, Outram, R.D., 89, 23/6/61
ORUM, A. W., West Rd., Clevedon, 150, 5/9/61
OTEKAIKE SPECIAL SCHOOL, Private Bag, Oamaru, 47, 19/9/61
OUSTON, J. W., 1 R.D., Cambridge, 71, 14/9/61
PALLESON, N. C., Maharahara, R.D., Dannevirke, 75, 18/9/61
PATON, G., 17c, R.D., Oamaru, 42, 19/9/61
PATTERSON, F. G., Pryde Rd., Omimi, Waikouaiti, 40, 12/9/61
PENNO, R. L., Evansdale Rd., Waikouaiti, 20, 5/9/61
PESCINI, C., Arapaepae Rd., Levin, 127, 22/9/61
PHILLIPS, G. J., and SONS, Seadown, 3 R.D., Timaru, 144, 18/9/61
PLUNKET, J. F., and SONS, 1H R.D., Oamaru, 34, 19/9/61
POLLOCK, L., R.D., Outram, Otokia, 57, 23/6/61
POTTER, W. J., 3 R.D. (Fernhill), Napier, 39, 25/9/61
POWELL, Mrs K., Glover Rd., Hawera, 116, 25/9/61
PRITCHETT, J. T., 163 Winters Rd., Papanui, 8, 1/9/61
PRYDE, W. A., Gladstone Rd., Mosgiel, 27, 5/9/61
PURUA FARMS LTD., c/o Allen and McIndoe, Box 133, Dargaville, 181, 12/9/61
RIDDELL, W., R.D., Outram, 32, 23/6/61
ROBERTS, W. E. A., James Line, No. 10 R.D., Palmerston North, 38, 6/9/61
ROBINSON, L. F., Black Rd., Otatara, 7, 19/9/61
ROIRI, M., Box 30, Otaki, 81, 4/9/61
ROSE, F. E., Paerata, 50, 13/9/61
RUSSELL, A. A., North St., Kihikihi, 128, 20/9/61
RYDER BROS., River Bank Rd., Otaki, 125, 4/9/61
SAGE, A. H., Domain Rd., Otaki, 61, 5/9/61
ST. BEDE'S COLLEGE, Main North Rd., Papanui, 16, 21/8/61
SCANLAN, J. M., Brooklands Mill, Milton, 62, 25/9/61
SHAW and SHAW (No. 1), Guy's Rd., East Tamaki, 71, 28/8/61
SIMCOX, F. S., Box 19, Manakau, 69, 19/9/61
SIMS, L. W., P.O. Box 46, Te Horo, 139, 25/9/61
SMALL, L. S., and CO., Wainui Rd., 2 R.D., Silverdale, 69, 19/9/61
SQUIRES, V. L., Luckens Rd., Kumeu, R.D., Henderson, 65, 15/9/61
STALKER, E. J., Greenpark, 4 R.D., Christchurch, 162, 14/7/61
STORER, T., c/o Post Office, Stirling, 61, 9/6/61
SULLIVAN BROS., Fox Glacier, South Westland, 10, 18/9/61
SULLIVAN, W. P., 10 R.D., Palmerston North, 43, 19/9/61
SUTTON, G. R., Box 41, Te Horo, 70, 12/9/61
SVENDSEN, H. N., Grey St., Pukekohe, 66, 30/8/61
SWIFT, K. D., Ashburton Forks, 1 R.D., Ashburton, 21, 1/9/61
SYMMANS, L., Mountain Rd., Sentry Hill, 96, 11/9/61

(Continued at bottom of page 564)

Thorough Planning Essential in Control of Gorse

By W. F. LEONARD,
Senior Scientific Officer,
Department of Agriculture,
Christchurch

CONTROL of dense gorse, especially on non-arable country, is a form of land development that requires thorough planning from the start. Success hinges ultimately on the provision of a vigorously competitive pasture cover under controlled grazing management.

After burning, grazing management is most important in control of regrowth and seedling gorse.

STEPS taken to achieve the desired result may vary in detail, but are essentially:

- The complete removal of existing gorse cover.
- Oversowing and topdressing to provide competitive cover.
- Concentrated stocking to counteract regrowth and seedling gorse—with adequate subdivision for such purposes—and follow-up treatment of any reviving gorse plants.

Removing Existing Cover

Burning is essential in the initial stages of control. A really good burn is needed, because the amount of regrowth requiring treatment later will be inversely proportionate to the intensity and completeness of the burn. Excluding stock well in advance of the burn allows undergrowth to accumulate and this, in turn, contributes toward a satisfactory burn.

Alternatively, and especially where ideal burning conditions cannot be achieved by other means, an aerial application of 2,4,5-T oil-soluble ester concentrate at 1 to 2 lb (active ingredient) per acre in diesel fuel oil in summer will desiccate the area and assist an autumn or spring burn.

Burn when the material is as dry as possible, preferably against the wind on a near-calm day.

Oversowing

The time of burning is determined by the season of the year most favoured locally for oversowing, as this should follow immediately on burning. The seeds mixture should contain good strains of reliable purity and germination. The kinds and quantity of fertiliser to apply depend on soil requirements. Any doubts about seed mixtures and fertiliser requirements should be referred to the local farm advisory officer.

Management

Subsequent grazing management is most important in the control of regrowth and seedling gorse which inevitably follow the burn. Seedlings or regrowth should not be allowed to reach a stage of maturity unpalatable to stock. Use large numbers of animals for short grazing periods to avoid preferential browsing, which is detrimental to the establishment of oversown species. Adequate subdivision is essential for good grazing control.

Judicious grazing should prevent seedling establishment, but some regrowth from surviving stumps must be expected. Stump regrowth should be dealt with by spot spraying during the following summer. Use 2,4,5-T emulsifiable ester at 3 to 6 lb a.i. in 200 gallons of water. Confine the spot spray as much as possible to the gorse plants to avoid undue pasture damage. Thoroughly wet with spray all gorse regrowth, as 2,4,5-T does not translocate readily in gorse.

This follow-up treatment is imperative to successful eradication.

A dense, vigorous pasture is the best and cheapest insurance against reinfestation. Subsequent topdressing and grazing management of the area should aim at maintaining a competitive cover of useful pasture species.

Town Supply Herds

(Continued from page 563)

THOMPSON, A. J., Tramway Rd., Hamilton, 159, 14/9/61
VANSTONE, R. W. E., R.M.D., Kaikoura, 87, 13/8/61
WAGHORN, R. and G., Little Akaloa, R.D., Duvauchelle, 131, 8/9/61
WALKER, A. J., Ardmore, 136, 11/9/61
WARD, D. C., 1 R.D., Outram, 58, 25/9/61
WATSON, C. S., Springston, 4 R.D., Christchurch, 90, 19/9/61
WATSON, D. N. H., Greenpark, 2 R.D., Christchurch, 74, 19/9/61
WAUGH, N. G., 1 R.D., Outram, 36, 5/9/61
WEBB, Miss A., Post Office, Pakuranga, 4, 6/2/61
WEBBER, E. O., 9 R.D., Te Puke, 213, 28/8/61
WEIR, R. S., Fairview, R.D., Timaru, 50, 12/9/61
WERDER, J. J., Onewhaia Rd., Te Roti, 64, 22/9/61
WHEELER, T. M., and SON, Motukarara, 2 R.D., Christchurch, 58, 31/8/61
WHITEMAN, A. J., Whitemans Valley, Upper Hutt, 94, 19/9/61
WHITFORD, G. H., Ponga Rd., Papakura, 48, 29/8/61
WHITTFIELD, R. J., Waikite Valley, 1 R.D., Rotorua, 143, 25/9/61
WIGGINS, M. C., Tikitere, Rotorua, 153, 19/9/61
WILLIAMS, L., Motukarara, 2 R.D., Christchurch, 43, 4/9/61
WIRIHANA FARMS LTD., Wilsons Rd., Netherton, 91, 30/8/61
WOODS, H. R., Motukarara, 2 R.D., Christchurch, 67, 4/9/61
WOODS, J., and SON, Motukarara, 2 R.D., Christchurch, 68, 4/9/61
WRIGHT, L. A., Tasman Rd., Otaki, 63, 28/8/61
YEOMAN, G. R., Section 1, R.D., Whakatane, 210, 4/9/61
YOUNG, J. F., 1 R.D., Gisborne, 35, 25/9/61
YOUNG, R. E., Mill Rd., Invercargill, 42, 25/9/61
YOUNG, R. J., Horohoro, 1 R.D., Rotorua, 117, 4/9/61
WILSON, G. E., Manutuke, Gisborne, 182, 25/9/61

Cancelled or Suspended Certificates

The following certificates have been cancelled or suspended:

BRYANT, W. L. and C., Box 29, Manakau, 216, 23/5/61
CLIFTON, S. R., Box 14, Te Horo, 110, 9/5/61
DAWSON, P. M., Smales Rd., East Tamaki, 162, 6/3/61
FEATHERSTONE, J., Arawhata Rd., Paraparaumu, 107, 18/3/61
HUNTER, V. G., Soldiers Rd., Ohau, 32, 8/5/61
JENSEN, E. J., Box 25, Otaki Railway, 71, 31/1/61
JOYCE, DOUGLAS, LTD., Valley Rd., Albany, 48, 10/3/61
KIRKBRIDE BROS., Ihumatao Rd., Mangere, 118, 2/5/61
McDAID, D., P.O., Hinehopu, Potoiti, 24, 27/3/61
NIELSEN, C. N., Takapu Rd., Manukau, 108, 23/4/61
PETRY, J. R., Red Hill Rd., R.D., Massey, 93, 14/3/61
PRICE, G., Dudley Rd., Te Pu, Rotorua, 120, 20/6/61
ROBERTSON, G. W., Ohau West Road, R.D., Ohau, 79, 7/3/61
SMALL, E. S., 6 R.D., Paiaka Rd., Koputaroa, Levin, 66, 16/5/61
VAUGHAN, G. W., No. 1 Herd, Te Ngae Rd., Rotorua, 84, 18/7/61
VAUGHAN, G. W., No. 2 Herd, Te Ngae Rd., Rotorua, 84, 18/7/61

ROUND THE RESEARCH STATIONS

Current Work and Findings in Department of Agriculture and Department of Scientific and Industrial Research Trials and Experiments

Ruakura

Two-tooth Infertility

For many years systematic work on the poor performance of the Romney two-tooth ewe has been carried out at Ruakura. The most important practical outcome so far has been the demonstration that shearing of the two-tooth ewe immediately before mating increases lambing percentage, advances lambing dates, and reduces the number of empty ewes. In the course of these studies it has been found that the two-tooth ewe tends to come in season normally, to mate successfully, to produce fertilised eggs as a result of such mating, but, despite this, to be associated with a low pregnancy rate. Obviously the fertilised eggs die off at an early stage.

In studies of this problem it has now been found that there is a tendency for the fertilised egg of the two-tooth ewe to reach the uterus within a few days after tupping, so that the time spent in the fallopian tubes is subnormal compared with that in older and more fertile ewes. It is believed that this situation results in the death of the fertilised egg, which arrives in the uterus before this is ready to receive it. The precise cause of this phenomenon is now being sought. In this search special attention will be paid in the near future to the relationship of plane of nutrition to the sexual development of the young female sheep.

Tobacco Research Station

Irrigation of Tobacco

Irrigation of flue-cured tobacco is increasing every year. Trials have shown that increases in yield of 200 lb or more of cured leaf can be expected as the result of irrigation. No benefit, however, has been secured by applying water within six weeks after planting. Rather has this resulted in a shallow-rooted crop which suffers badly from adverse weather. In addition early watering causes a leaching of the fertiliser followed by the production of pale, thin bodied leaf.

The irrigated tobacco had a more abundant rooting system than did the non-irrigated. Irrigation also hastened the maturity of the crop. By early February 50 per cent of the leaf had been harvested from the irrigated plots, compared with 32 per cent from the non-irrigated. This meant that the leaf from the watered plots ripened and was harvested in the warmer weather, resulting in a better class of leaf. Such earlier ripening also means that the season is shortened and the frost risk reduced.

Wallaceville

Selenium Content of Animal Tissues

A considerable number of chemical analyses have shown that selenium is a normal constituent of all animal tissues, whether or not extra selenium has been given. The kidney and liver are relatively richer in selenium than is muscle tissue. Studies with radioactive selenium have shown that even with high levels of selenium dosing, the element is rapidly eliminated from the body. Other evidence shows that no human hazard can result from the consumption of meat from sheep or cattle given selenium doses at the recommended rates.

Ruakura

Toxicity of Spores of Facial Eczema Fungus

The current warning system for facial eczema is based on information derived from weather data and spore trapping with the Brook spore trap. While it is hoped that this system will be an improvement on the use of weather data alone, the method would undoubtedly be much more effective if it were known whether the spores collected by the trap were toxic or not. Though high spore counts appear generally to be associated with danger periods, there is sufficient evidence to indicate that all spores are not necessarily toxic. Differentiation between toxic and non-toxic spores is thus of great practical significance.

A method for doing this has been devised at Ruakura by use of a modified vacuum cleaner method by which samples of spores can be collected in sufficient numbers for both chemical and small animal assay for their toxic properties. This method is being tried out on an experimental basis at Ruakura this year.

Wallaceville

Radioactive Cobalt Bullets

A method of making cobalt bullets permanently radioactive has been worked out at Wallaceville and is giving very encouraging results. This means that with the use of relatively inexpensive equipment it should be possible to detect any losses of bullets which occur in live experimental animals.

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BETTER Farm MACHINERY

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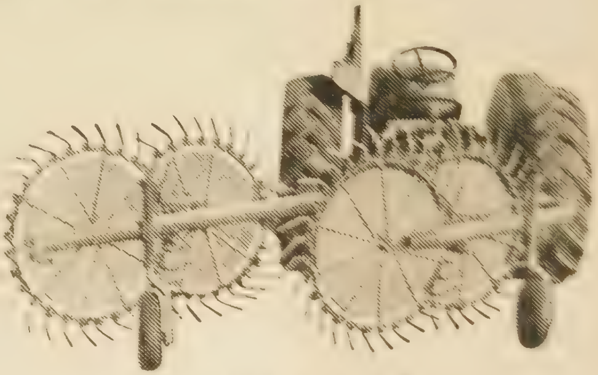
I am more than satisfied with the rake. We found that swath turning at high speed threw the hay up well for drying, and windrowing at a slower speed made a much neater job than other machines I have used. I was particularly surprised that during the season no reel fingers were broken, especially on the type of country we cover, which is often very rough. All together we raked 200 acres with the machine this season.

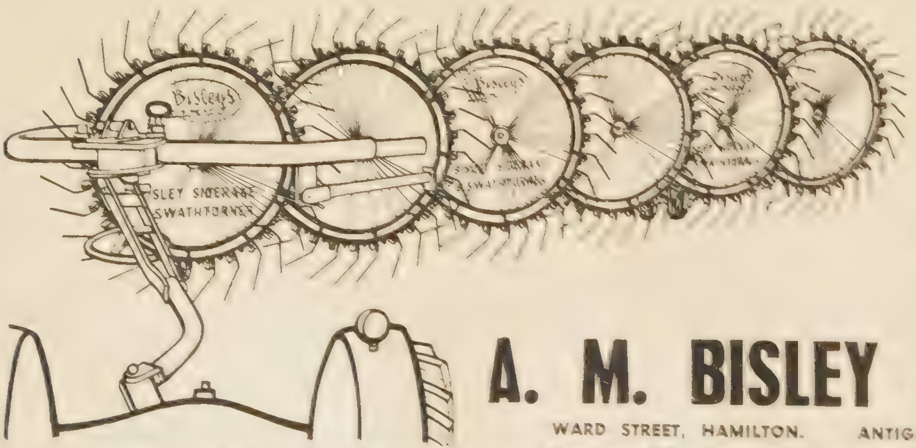


Model 4.S

This rake handles up to two 6 ft. swaths. A 5th reel can be added for extra raking width.

Priced from £156

YOUR CHOICE OF SIX MODELS



Model 6 S.T.

Trailer type for raking a complete 12 ft. swath width or turning two complete 6 ft. swath widths at the same time. Particularly useful for raking light or heavy crops of hay or lucerne when the whole swath is to be moved in one action prior to baling.

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BUILT-IN WEIGHT PENETRATES THE HEAVIEST CROPS

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Colony Management during the Honey Flow

Seasonal Notes for the Domestic Beekeeper

By G. L. JEFFERY,
Apicultural Advisory Officer,
Department of Agriculture,
Gore

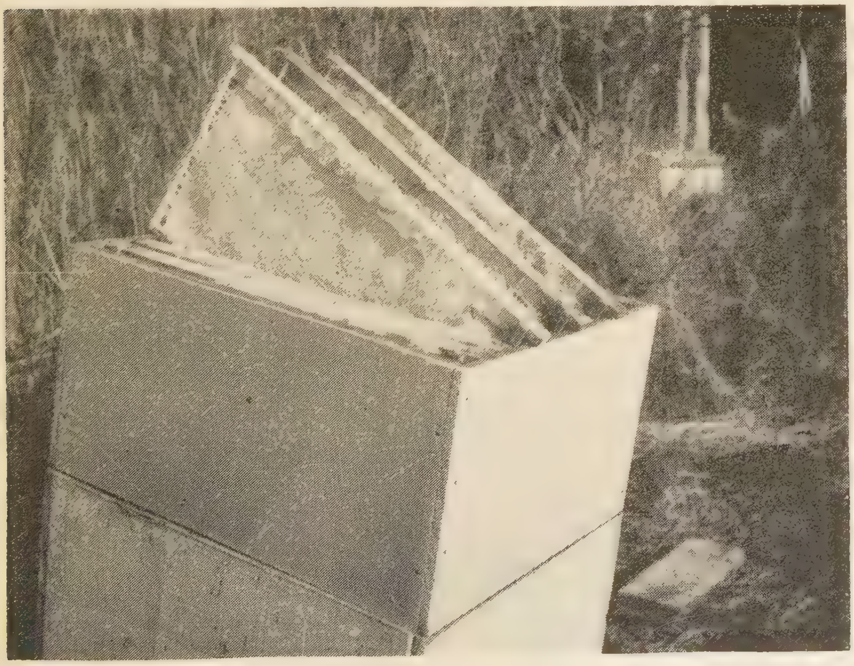
COLONIES should now be at their peak and brood rearing should remain at the maximum until the main honey flow begins. If honey reserves are low and the weather is unfavourable for bee activity, a supplementary feed of sugar syrup will help keep the colony prosperous until the beginning of the honey flow. Colonies may still be making swarming preparations, but the impulse to swarm will usually cease once the main honey flow is in progress.

IN most districts the flush of the main honey flow from white clover seldom starts before January. However, a close check should be kept on hives, as additional supers may be needed earlier if the weather is favourable. Young brood should be kept packed into the lower brood box. When the honey flow starts and the older brood within the upper super has hatched, the worker bees will rapidly fill the empty cells with new honey, giving a well filled second storey for winter stores.

Most colonies will be occupying three supers when the honey flow begins. The necessity for additional supers is indicated when the combs in the hives are well filled and the bees begin to build out the combs along the top edges with new wax, giving them a fresh, white appearance. During a good honey flow extra empty comb space is valuable, as it allows room in which new honey can be ripened by the worker bees before it is stored in cells and sealed. Because of this it is better to add extra supers a little ahead of requirement instead of waiting until nearly all available comb space is full of honey. One or two combs of honey placed in the centre of the added super will encourage worker bees to enter it and store honey in the new combs.

Section Honey

If section honey is being produced, the outside positions in the honey super are best filled with drawn extracting combs. In this position these combs attract the bees through the queen excluder on to the sections, and the sections are in the central portion of the super, where they will be better filled.



Fully capped combs of honey ready for removal from the hive.

Most colonies produce good sections at the flush of the honey flow, but are very reluctant to draw out and fill sections once this has passed. It is best therefore to remove the sections as they become fully sealed and replace them with drawn extracting combs once the honey flow begins to decline. In removing sections from the hive the minimum of smoke should be used so that the bees are not encouraged to perforate the cappings of the sealed honey. Care should also be taken against damaging the sealed surface of the combs. The wooden surfaces of the sections should be scraped free of propolis and rubbed lightly with sandpaper to make them attractive for sale.

If sections are to be stored, it is better to wrap them in transparent wrapping material and keep them in a room with a moderate temperature. Cold temperatures should be avoided, as these cause the wax in the comb to become brittle and fracture.

Honey Extraction

Honey for extraction can be removed as soon as the combs are well capped.

The equipment required by a domestic beekeeper with only one or two hives need not be very elaborate to obtain extracted honey.

The ideal equipment consists of a two-frame reversible extractor, a heated uncapping knife, some kind of straining apparatus, and a small settling tank. With this combination quite large quantities of honey can be handled. Where this equipment is not available and only a small quantity of honey has to be dealt with, the simplest arrangement is to scrape the honey combs down to the midrib with a tablespoon. The scrapings are placed in a colander and after they have drained, the honey is strained through muslin cloth and packed into glass jars or other suitable airtight containers.

Care of Livestock during January

By Wallaceville and
Ruakura Animal
Research Stations

SHEEP DIPPING

MODERN dips are so effective that the eradication of lice and ticks should be quite feasible. Best results, however, will be achieved only if the instructions for mixing and replenishing dips are followed accurately. Carelessness in dipping can cause disastrous losses. If sheep are dipped off shears, the shear cuts are liable to become infected and deaths from blood poisoning may occur. These can be prevented by vaccinating with blackleg vaccine at least a fortnight before dipping. The vaccine is available at a reasonable price. Departmental Veterinarians or Livestock Instructors should be consulted regarding its use.

ST. JOHN'S WORT MAKES DIPPING DANGEROUS

Sheep that eat St. John's wort become sensitive to sunlight and scabs develop on the ears, face, and back. If sheep in such condition are dipped, they take convulsions and may be drowned. If possible, sheep should be grazed on country free from St. John's wort for several weeks before dipping. If this is not possible, dip on dull days only.

LAMB WEANING

Weaning is an important event in the life of a lamb and special care at this time will be well repaid. Long wool lambs should be shorn and all others crutched.

Hogget ill thrift in the North Island seldom manifests itself before the flush autumn growth appears. Before this time lambs should be given the pick of well controlled pastures, as these give best liveweight gains. At first sign of failure to do well on such feed they must be given the longest and most mature feed available. In most districts preparations to have such feed available must be made before the summer dry spell.

The hoggets should be stocked as lightly as possible for best results. Drenching is seldom necessary during the dry period, and the first drenching should be about two weeks after rain and should always be followed by an immediate shift into a clean paddock, preferably prepared in advance by cattle. Drenching of the hoggets may be necessary at about three-weekly intervals during warm, humid conditions.

TEST FOR COBALT DEFICIENCY

Cobalt deficiency may be a cause of unthriftiness in lambs from an early age, but is more likely to be important from about weaning time onward. If the disease is suspected, a trial should be conducted to measure the effect of dosing with cobalt. Cobalt bullets are suitable for this purpose, but have certain limitations. Local officers of the Department of Agriculture should be consulted about the planning of such trials.

GRAZING MANAGEMENT OF DAIRY CALVES

Calves which are not well grown by this time of the year will be difficult to get through the winter unless they are given special attention now. Carefully controlled experiments have consistently shown that a system of rotational grazing gives far better results, even through paddocks with apparently little feed available, than a system of set-stocking on long, mature pastures. A daily ration of 5 to 10 lb of good quality silage is a suitable supplement to summer pastures and will be amply repaid by less trouble later in winter.

MILKING MANAGEMENT

High-producing cows usually have a long lactation. Recent research at Ruakura reveals that milking technique plays an important part in keeping cows in production. In many cows the duration of milk let-down begins to decline from November onward. From this time through to the end of the lactation an adequate stimulus is essential to encourage maximum production. A 30 second wash is sufficient to start let-down in most cows. During this period the udder and teats should be hosed with running water and at the same time firmly rubbed with the hand. As a routine, a squirt of milk should be drawn from each teat. This not only helps to stimulate let-down but serves to check each quarter for mastitis.

EWE FLOCK MANAGEMENT

Do ewes get fat because they are dry, or dry because they are fat? In spite of the widely held view that fat ewes are often difficult to get in lamb, research at Ruakura indicates so far that the ewe flock which is fat just before mating grows more wool, produces more twins, and has fewer dry ewes than one in which the ewes are thin. Such findings suggest that there is no good reason for grazing the ewe flock from weaning onward any harder than is necessary to ensure that sufficient feed is saved for the lambs and cattle and for flushing later.

MANAGEMENT OF RAMS

Ninety per cent of ewes are tupped during the first four weeks of the mating period. To cope with this concentrated effort the rams must be fit, fertile, and free from infection. Those unlikely to meet these requirements should be culled now. Replacements should be bought in ample time to allow them to settle down and become acclimatised in their new environment.

Vaccinate those rams not already protected against *Brucella* infection at least two months before tupping begins. Shear them, dip early, and get their feet in good order by careful trimming.

Four to six weeks before mating flush the rams on good feed, preferably in paddocks with ample shade.

SELENIUM AND ANIMAL HEALTH

Some forms of unthriftiness in lambs before and after weaning can be prevented and controlled by selenium administration. Details of treatment for unthriftiness and other disease conditions responsive to selenium appeared in the October issue of the "Journal".

Seasonal Notes

By Farm Advisory Division

ALLOCATING HILL COUNTRY TOPDRESSING EXPENDITURE

IMPROVEMENT on hill farms can be spectacular provided a systematic, block by block development programme is strictly adhered to. Experience has indicated that the hill man can afford to spend from 10s. to 12s. a ewe yearly on maintenance topdressing. By so doing he is able to increase his ewe flock each year by the 7 to 8 per cent that is possible from breeding, and at the same time he may have some revenue available for capital expenditure. Expenditure on topdressing in excess of this should be regarded as capital expenditure, as it will necessitate buying capital stock to use the extra grass grown.

By budgeting the topdressing to about 1 ton to 30 ewes one can keep within the suggested limit, but a carrying capacity of 3 ewes to the acre has to be achieved before the whole farm can receive an annual maintenance dressing of 2 cwt of phosphate per acre. In working toward this carrying capacity a farmer should regularly topdress the better paddocks with their full maintenance requirement. Any surplus fertiliser can then be used on a run-down block that has been well fenced and is not too large to permit a heavy dressing of phosphate from the year's quota. Oversowing with clover and careful mob stocking will ensure full value from the fertiliser. The next year this block will join those receiving the maintenance dressing and a further run-down area may be selected for improvement.

A planned programme such as this enables full value to be obtained from the fertiliser, and the increased revenue accompanying the steady rise in carrying capacity from breeding alone will enable systematic development of the poorer blocks.

—J. D. CURRIE, Hamilton

LUCERNE ESTABLISHMENT WITH WHITE-FLESHED TURNIPS

ON free-draining light-textured soils ideally suited to the growing of lucerne sowing in January-February with white-fleshed turnips, usually York Globe, has proved a highly successful method of establishment. A summer fallow facilitates the preparation of a fine, firm, weed-free seedbed with sufficient moisture for rapid germination and early growth.

Seeding rates of both turnips and lucerne need not be varied from the normal, 5 to 8 oz of turnips and 10 to 14 lb of lucerne having proved satisfactory. Similarly the method of sowing is not critical and good results have been achieved with drilling both turnips and lucerne, broadcasting both, and drilling one and broadcasting the other.

Lucerne seed should be inoculated with an approved bacterial culture. The bacteria can be killed by exposure to sunlight or hot, dry conditions and by contact with superphosphate or other soluble fertilisers. Drilling of the lucerne seed is therefore favoured where heat and dryness are likely to affect broadcast sowings, and seed should not be mixed with superphosphate. Reverted or serpentine superphosphate mixed with an equal quantity of lime is generally recommended.

Fertiliser damage to the bacteria can also be avoided by inoculating the seed and then coating it with lime by the very simple method described on page 619 of the December 1960 issue of the "Journal". Inoculation by this method also remains effective longer, thus ensuring against delays and slow germination.

The young lucerne plants develop rapidly in autumn with a strong, deep rooting system and, contrary to once popular belief, will withstand even very heavy grazing in late winter and early spring, when they are dormant. Inclusion of the turnips results in suppression of weed growth, and areas left completely blackened by grazing at the end of August have produced good, pure first cuts of lucerne hay in October.

—S. M. J. STOCKDILL, Palmerston

PREPARATIONS FOR OVERSOWING HILL COUNTRY

CLOVERS strike best on areas where all rank growth has been removed and the sward opened up. The size of the area to be tackled depends on the subdivision of the property and the numbers of stock available. Usually a tenth of the property can be managed each year.

During summer gorse or scrub should be removed or burnt. Cattle are ideal to clear roughage, and the ewe flock after weaning can be concentrated on the block to graze the feed short. In North Island east coast hill country areas a dry season will assist in baring the ground. These preparations aim at having the area in a suitable condition for oversowing in autumn, when enough rain has fallen.

In the colder inland high hill country spring sowing of clovers with topdressing gives worth-while results. On this type of country spring sowing is generally best. There is little rank growth after winter, the soil is moist, and the spring weather assists the development of young clover plants.

White clover is by far the best clover and should be included in all mixtures except on the driest of soils. It thrives best where the rainfall is over 30 in. and soil has good moisture retention. Subterranean clover should be used where the rainfall is below 30 in. and particularly where summer and early autumn are very dry and the soils light.

Though it is important to sow clovers at the right time of the year, phosphatic topdressing can be applied over most periods of the year to suit the management of the property.

—W. B. H. SMITH, Masterton

PROTECTION OF STORED SILAGE

SILAGE making is a fairly costly form of pasture conservation. When silage is made in the form of a clamp, bun, or circular stack, up to 50 per cent of the original nutritive value of the pasture ensiled is lost through the action of percolating rainwater, aeration, and overheating. But when it is made in pits or concrete or wood-walled bunkers and then covered these losses can be reduced to about 25 per cent, because less silage surface area is exposed to the air and because rainwater cannot enter.

Permanent or removable corrugated iron or aluminium roofs, which are sometimes placed on wooden frameworks over clamps or pits, will exclude rainwater but not air from a clamp, so some wastage can still occur. In a roofed pit wastage through aeration is not as great, since the top and end surfaces of the pit are the only parts exposed.

The ideal method to reduce wastage to a minimum is to use plastic sheeting. This excludes both air and water from the ensiled material. If an unroofed pit is used, build the clamp so that there is a "hollow" down the centre; the amount of water running down the sides of the pit is then kept to the minimum. After final consolidation place the plastic sheet in position and cover it with a 6 in. layer of sawdust. Even though covering will reduce wastage, best results can be obtained only if good-quality pasture is used and consolidation is heavy at all stages during ensiling.

—C. J. CHRISTIE, Stratford

Developments in Production and Marketing of Beef and Veal

CHANGES in the marketing of beef and veal, particularly the phenomenal growth of boneless meat exports, are emphasising the desirability of:

- A high yield of edible meat in the carcass.
- A relatively high proportion of best-quality cuts in the edible meat.

Speculating about producing for present and likely market requirements, G. C. EVERITT (left), Scientific Officer, Department of Agriculture Ruakura Animal Research Station, suggested at the Ruakura Farmers' Conference that yield of edible meat per acre—even perhaps the yield of best quality cuts per acre—might become the criterion. Such thoughts, he contends, should be studied seriously. This article is an adaptation of Mr Everitt's conference paper.

RECENT trends in meat marketing, particularly of beef, have focused much more intense producer interest on the carcass: its weight, its shape, but especially its composition in terms of muscle, fat, and bone. It is in connection with the last aspect, the composition of the carcass, that production methods in relation to meat marketing have become so important.

Beef Marketing Statistics

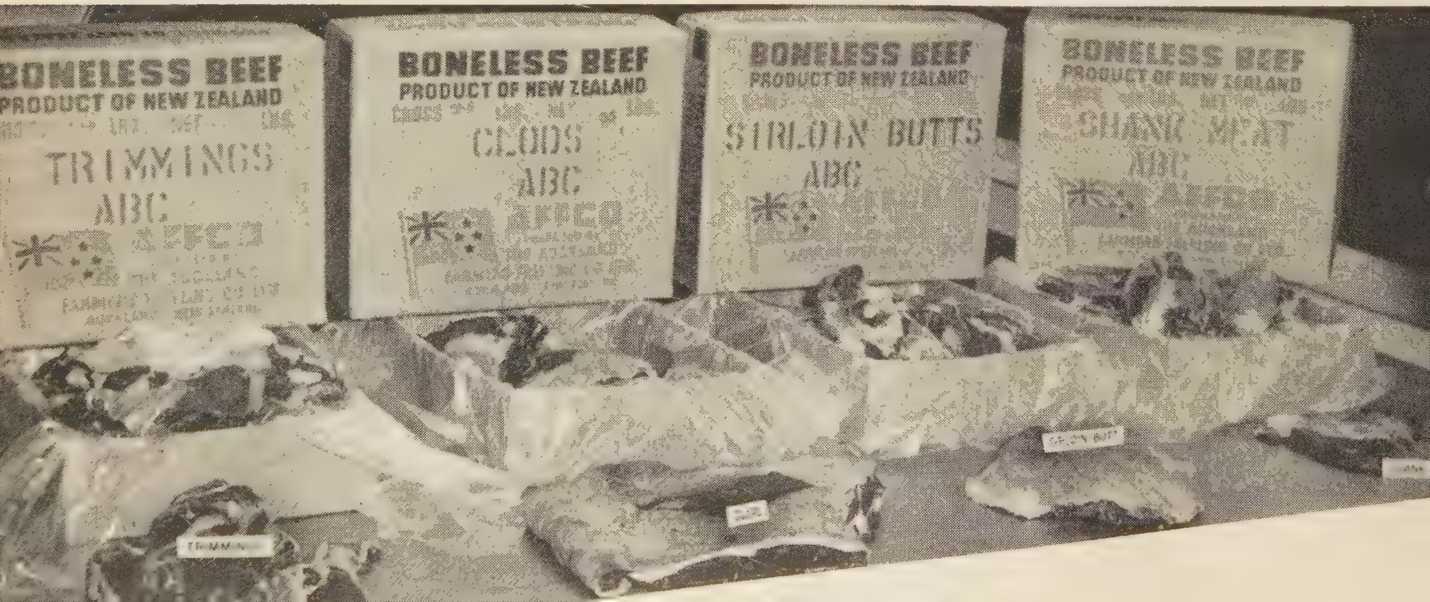
The amounts and percentages of beef and veal exported from New Zealand to the United Kingdom and North America between 1955 and 1959 are shown in Fig. 1 (page 573). The decrease in exports of beef and veal to the United Kingdom from nearly 70,000 tons in 1955-56 to only 8,151 tons in 1958-59 is most striking. Equally apparent is the marked increase in exports to North America from 1,761 tons in 1955-56 to over 76,000 tons in 1958-59, with a peak marketing of 83,268 tons in 1957-58. The high percentage of boneless beef and veal exported, especially to the North American market, should be noted; over three-quarters of total exports in 1958-59 were classed as boneless.

There has been a similar but even more marked change in recent beef exports from Australia. Fig. 2 (page 573) shows the amounts and percentages of beef exported from Australia to the U.S.A. between 1955 and 1959. Approximately 977 tons were exported in 1955. The following year exports increased to 1,315 tons, rose again in 1957 to 2,416 tons, and again in 1958 to 7,192 tons. The provisional estimate for 1959 is more than 99,000 tons. Over 96 per cent of the beef exported in each of these years was classed as boneless, the bulk being of manufacturing quality with very little first or second quality. Notice also the increasing proportion of boneless beef sent to the United Kingdom over these years.

Boneless Beef for U.K. Market

These statistics demonstrate the startling increase in the proportion of beef being exported in the boneless form today from New Zealand and Australia. Nor is this type of meat export trade confined to North America. Britain, perhaps the most tradition-bound country in the world, has been affected. In 1956 about 10 per cent of all beef imported into Britain was boneless. By 1959 the quantity had risen to about 14 per cent.

Many factors favour increasing exportation of boneless beef. One of the most important is that, compared with quartered chilled beef, three times as much boneless beef in cartons can be carried in a ship's lockers, or twice as much as quartered frozen beef.



Present shortage of suitable shipping facilities is a problem in meat marketing. In Australia a special freight rate for packaged beef destined for the United Kingdom was introduced in 1958, the price per pound now being considerably less than for whole quarters. In Australia the authorities have also recently reduced the maximum weight for exportable frozen hind quarters from 210 lb to 200 lb chilled weight, heavier quarters than these being boned out. Moreover, overfat carcasses have now to be broken up and the meat trimmed of excess fat.

Finally, it can be reasonably argued that the export of bone-in beef (and much the same applies to other meats), is a waste of native resources. Preparing boneless meat uses skilled and unskilled manpower in the country of origin, and the by-products of the process, such as fat and bones, are also retained.

At present there are signs that the North American market will not continue indefinitely to absorb the same large quantities of New Zealand beef. A peak of this trade was attained in 1957-58, but a decline now appears to be under way. Three factors, at least, can be held responsible for this trade abatement.

Firstly, the pendulum of stock numbers in the United States has been steadily swinging back from a depleted cattle population to one capable of satisfying immediate and even increased domestic demands for beef. Secondly, the tremendous impetus in chicken and rabbit meat production in the United States, common also to the United Kingdom (with an estimated production per year of 100 million broilers and 20 million rabbits), cannot be ignored. Lastly, but by no means least important, it has already been suggested that New Zealand has recently had to face severe competition for the American trade in boneless beef from Australia, and Australian beef is at a distinct advantage, for it carries much less fat at an equal weight than comparable New Zealand beef.

Challenge from Australia

Over-emphasis of Australian competition in the world beef market is hardly possible. It is from this direction that New Zealand is now facing, and will continue to face, a very strong challenge. Potential beef production in Australia is almost unlimited, and the recently instituted beef research levy (about 2s. on every beef carcass) will undoubtedly help to solve many of the production and processing problems in Australia today in much the same way that an invaluable service has been performed for the wool industry by a wool research levy.

These recent trends in the processing and marketing of New Zealand and Australian beef are likely to exert a profound influence on future events. Even if allowance is made for the entry of Britain into the European Common Market, New Zealand will probably revert once more to the United Kingdom as a major outlet for her exportable beef.

Tradition dies hard at Smithfield market, but recent reports reveal that several of the larger firms there are seriously considering the handling of packaged wholesale cuts of boneless beef. To a large extent this new concept has arisen from the phenomenal rise in self-service retailing in Great Britain during the past few years, affecting the whole of the food industry. The rising cost of labour has been a potent force in this.

Pre-packaging is a vital adjunct of self-service marketing. Meat, as a quickly perishable food, poses many peculiar problems in relation to pre-packaging at the retail level, but these problems are being attacked from all sides by food technology specialists. It would appear logical for meat wholesalers to prepare retail pre-packs of meat cuts; the large volume of meat handled reduces the overhead costs per pound, often so prohibitive to the smaller retail butcher; skilled labour can be employed in preparing meat cuts, with teams of less skilled labour employed in weighing, pricing, and pre-packaging. Moreover, the large quantities of meat handled justify the installation of fully automatic packing machinery—a further reduction in costly labour.

These are vital considerations from the meat trade point of view, and it is heartening that New Zealand meat traders have already felt the "wind of change" blowing through the industry and are beginning to dress their product accordingly. Already the meat trade here has a lead over British wholesalers. No doubt it will be retained.

The alternative for the future is to allow British wholesalers to pre-pack wholesale cuts, or even retail cuts, for distribution to retail butchers in Britain. Axiomatically, this possibility necessitates a retrograde step in meat marketing whereby meat would continue to be exported from New Zealand in carcass form. The somewhat unjustified British consumer prejudice against frozen beef, and apparent preference for fresh and chilled beef, will prove a difficult obstacle to surmount.

High Standards in Boning out

Methods of meat marketing do not remain static, and the meat producer must be constantly alert and able to adapt his methods to any changes. The insistence of American beef importers on stringent measures to ensure a high standard of hygiene in New Zealand freezing works in the preparation of

Samples of wholesale cuts of boneless beef packaged for the North American market.

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meat for export has forced vast outlays of capital on the renovation and construction of suitable accommodation in the works. In the main, these capital expenses have been provided for the preparation of boneless packaged meat.

To an almost inestimable degree the New Zealand meat trade has benefited from these changes. Even if the trade with North America for this type of produce is greatly reduced in future, the high standards of boning out have become established, whatever the final destination of the product.

Recent vigorous drives to establish new markets for meat products are healthy signs of an alert and thriving industry. Certainly, it is reasonable to consider that the protein-hungry countries of the world, particularly in the East, with no established and traditional methods of meat marketing, will be satisfied more and more with packaged meat produced and processed in pastoral New Zealand.

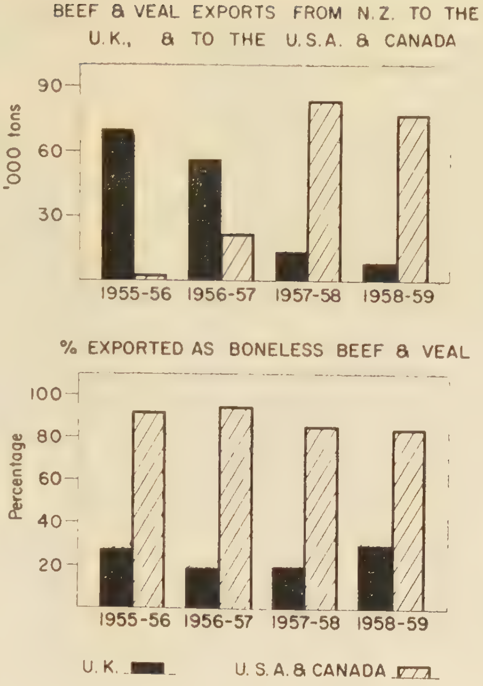

Fig. 1.

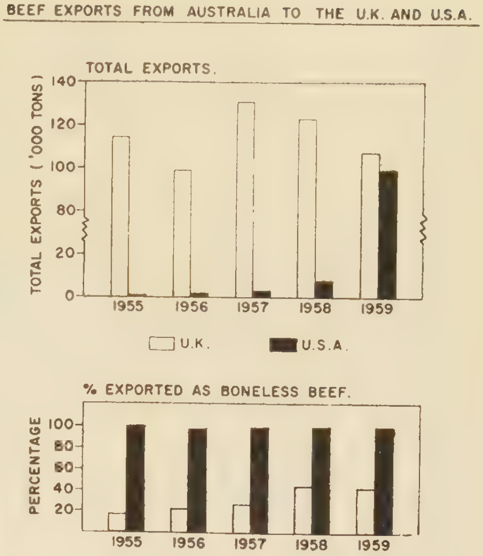

Fig. 2.

Relationship between Beef Production and Processing

These changes in meat processing and marketing affect production methods and farming profitability. At present three main methods of marketing are open to the New Zealand beef producer: in the saleyards, "on the hook", and by owner account.

In the last, the meat trading company processes the animals and sells the meat to best advantage on behalf of the producer, with standard deductions from the sale price to cover processing and commission. Many cattle today which are sold in this way may be boned out and it is the **edible meat**, as distinct from carcass weight, which is sold on the producer's behalf, though a nominal price is given for the bones and fat. Thus, the **proportion** of edible meat in the carcass becomes of vital concern to a producer when his cattle are processed and sold in this way.

From the producer's point of view, then, much greater emphasis than hitherto will have to be placed on the content of lean meat or muscle in the animal, the distribution of this muscle, and, not least, the fat content. Traditional concepts of conformation in the meat animal may have to be altered. At present the retail butcher is greatly influenced in his quality assessment of carcasses by conformation. Confronted with a number of polythene-wrapped packages, the poor chap must think again!

Similarly the optimum weight at which to slaughter meat animals may have to be reviewed. Today the ratios of lean meat to fat and bone must assume far greater importance as criteria of quality. These considerations will have to be balanced against the economics of producing light or heavy animals.

Some Factors Affecting Yield of Edible Meat

During the past two years, with the invaluable cooperation of the Auckland Farmers' Freezing Company at their Horotiu works, the yields of edible meat, excess fat, and bone of different classes of cattle, including some experimental cattle from Ruakura, have been recorded. The available evidence, though by no means complete, permits a brief review of some of the factors affecting carcass composition.

1. The influence of sex and weight

Table 1 summarises the yields of edible beef, excess fat, bone, etc., from steers and heifers of different carcass weights. For steers at a carcass weight of 540 lb the edible beef amounted to 66.8 per cent of carcass weight, fat 12 per cent, and bone, etc., 21.2 per cent. An increase of 140 lb in carcass weight, to 680 lb, elevated the edible beef percentage to 68.2 per cent and fat to 13.0 per cent, but decreased bone, etc., to 18.8 per cent.

TABLE 1—EDIBLE BEEF, FAT, AND BONE YIELDS OF STEERS AND HEIFERS

	Carcass wt.	Per cent of carcass wt.		
	lb	Edible beef	Fat	Bone, etc.
Steers	540	66.8	12.0	21.2
	680	68.2	13.0	18.8
Heifers	480	67.0	11.0	22.0
	530	64.6	15.4	20.0
	650	62.0	19.0	19.0

With heifers the pattern of compositional changes with increasing weight is rather different. At a light carcass weight of 480 lb the yields of the three tissues approximate to the yields derived from steers of 540 lb. The edible meat yield of heifers weighing 530 lb was only 64.6 per cent, but the proportion of fat had risen to 15.4 per cent. A further increase in carcass weight, to 650 lb, depressed edible meat percentage still further, to only 62.0 per cent, while fat had risen to nearly one-fifth of the total carcass.

These differences in the carcass composition of steers and heifers provide an excellent illustration of the earlier maturity of heifers; carrying animals of this sex on to relatively heavy weights is uneconomic. In other words, steers can be taken to heavier carcass weights than can heifers without markedly reducing the yield of edible meat by excessive fatness.

Examination of the yields of individual meat cuts from each class of animal reveals some interesting differences. For example, relatively heavy steers produce a higher proportion of poor quality cuts (brisket and chuck) and a lower proportion of best quality

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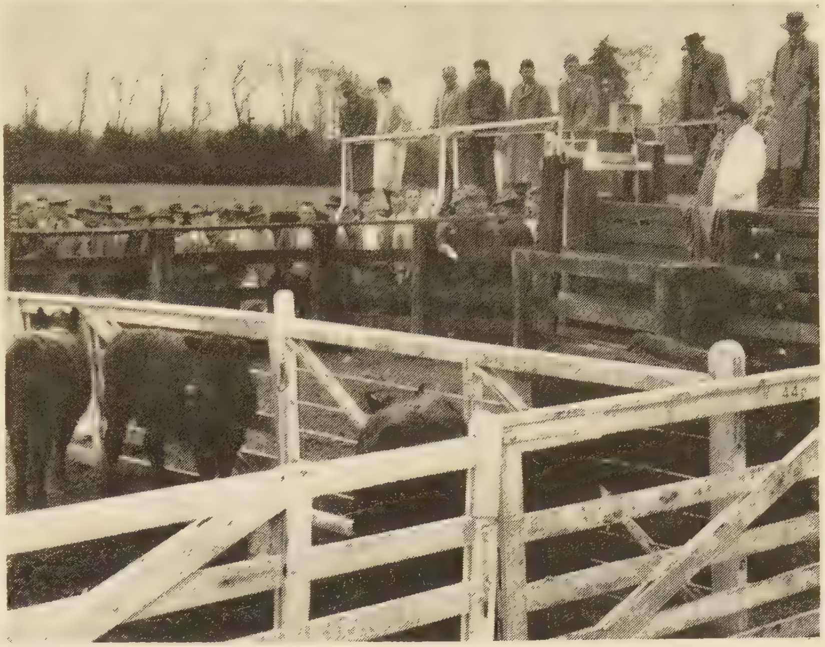
cuts (striploin, rump, butt) than relatively light steers. At some time in a beef animal's life there must exist a stage when the proportion of edible meat and the proportion of high-priced cuts are at an optimum, but this stage has yet to be clearly defined and will depend largely on the level of nutrition supplied to the beast.

At present the producer is paid a flat rate on all edible meat sold on his behalf. It can, therefore, be readily appreciated that a higher yield of edible beef secures a better financial return. Perhaps in the future a producer may be paid according to the yield of individual cuts of meat on a differential price system in much the same way as in wool selling. Cattle with a consistently high yield of edible meat, with a favourable distribution of that meat in the high-priced cuts, would necessarily command great respect. Indeed, no more sure or quicker method of beef animal improvement could be so easily devised.

To speculate a little more in this respect, is it plausible that a future criterion of meat production success will not be confined to just "carcass weight produced per acre", but the yield of edible meat per acre, and even, in the scientists' optimistic manner, the yield of best quality cuts per acre? What was your production of fillet steak per acre last year? Will this become a commonplace question? These thoughts should not be condemned out of hand, but rather should they be studied with some seriousness.



The importance in beef production of selecting the sire on the basis of liveweight gain records of his progeny was emphasised at a demonstration point during the Ruakura Farmers' Conference field day. Here R. M. Gallagher discusses with farmers the results of selection as evidenced in the progeny in the foreground.

2. The influence of nutrition

(i) Fattening Cattle

Meat producers may well ask: "In what other ways can the yield of edible meat be affected?" This is a very searching question and one which encompasses the whole complex of animal growth. In the long-term view animal breeding may exert a marked influence, and the beef bull performance test at present being undertaken at Ruakura should be of interest in this regard.

Another way in which the edible meat yield can be markedly altered is by the plane of nutrition given to the animal at different stages during life. This much-studied aspect of animal production has been supplemented by several recent experiments at Ruakura, designed for various purposes, some aspects of which cast light on this topic.

A period of poor growth in summer is common to New Zealand fattening cattle, the duration and the severity of poor nutrition in this period obviously varying in time and place. Fig. 3 shows a possible extreme example for New Zealand conditions (though it is common to other beef-producing areas of the world) where 11 three-year-old Aberdeen Angus steers were well fed for 87 days in the spring of 1959, increasing in liveweight by 2.92 lb per day. Between mid-December and the beginning of March (68 days) five of these steers were provided with extremely poor grazing (a simulation of severe drought conditions), as a result of which they lost nearly 1 lb in liveweight per day. The other six steers were fed so as to gain approximately ½ lb of liveweight per day in this period. Ample grazing for all 11 steers was resumed in early autumn, each steer being slaughtered as it attained 1,180 lb liveweight, the aim being to produce a carcass weight approaching, but not exceeding, 680 lb.

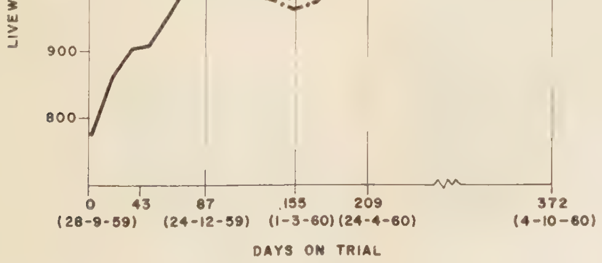


Fig. 3.

From a practical point of view the seasonal time of slaughter of fattening cattle is of obvious importance, a rapid turnover of stock being a basic factor in profitability. Table 2 shows that in this experiment steers given relatively good summer grazing required 257 days, on average, to attain the slaughter liveweight, whereas steers starved in summer required 296 days or 39 days longer. In other words, summer starved animals had to be carried well into the expensive wintering season and, indeed, some attained slaughter weight only in the succeeding spring.

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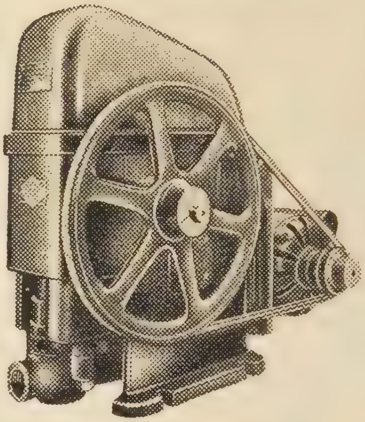

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TABLE 2—EFFECT OF SUMMER STARVATION ON THE GROWTH OF STEERS

Planes of nutrition	Days on trial	Dressing-out per cent	Carcass wt. gain per day lb
High	257	57.6	1.25
High-low-high	296	56.5	0.92
Difference	+39	—1.1	—0.33

Nor was this the only important result. Table 2 shows that steers subjected to summer starvation had a lower dressing-out percentage, and their carcass weight increase per day over the trial was 0.33 lb less than that of steers given relatively good summer feeding. The evidence on the composition of the carcasses is not yet complete, but the present indications are that the summer-starved steers were fatter at slaughter, with a lower yield of edible meat, than their counterparts. Poor summer growth of cattle is thus another factor affecting productivity and profitability. To what extent smaller fluctuations in the growth of beef cattle, even under ample grazing, affect carcass weight and composition is not known, but it is a facet of animal production from grass that requires the attention of research workers.

In more general, practical terms the economic feasibility of improving cattle feed under New Zealand fat lamb farm conditions during summer requires attention. This might be accomplished by a policy of saving pasture in spring and feeding off in summer, a practice which might integrate with the early weaning of fat lambs.

If, on the other hand, the fluctuations in liveweight reflect qualitative changes in the grass, it may be preferable to ensure maximum cattle weight gains from spring grass in anticipation of reduced summer gains. Alternatively, the feeding of conserved grass as self-fed silage in summer might prove of value.

In any event, the prime importance of eliminating drastic weight loss during the fattening process should be appreciated and steps taken to ensure a continuous **productive** plane of grazing nutrition. Beef cattle on New Zealand fat lamb farms must remain subservient, at least at present, to the more profitable production of fat lambs, but the grazing management of the two might be adjusted to the advantage of the cattle without adversely affecting the performance of the lambs.

(ii) Store Cattle

These considerations of beef cattle growth in the grassland environment inevitably relate to the relationships between breeding country and fattening farms. A trial still in progress is examining the effects of transferring steers at three different ages from Whatawhata Hill Country Research Station to Ruakura. Steers have so far been transferred soon after weaning, as yearlings, and at 20 months of age. Table 3 (below) shows the marked differences in weight for age between the groups.

From the previously described experiments the implications of the different levels of grazing nutrition at different stages in life on carcass weight and body composition at slaughter are of obvious importance. If the slaughter liveweight of these cattle is chosen to be 1,100 lb, the time that will be taken by each of the transfer groups to attain that weight from the age of 20 months can be calculated theoretically. Allowance must be made, however, for the well known fact that animals which have been restricted in growth for a period will subsequently grow faster when given good feed than cattle which were not restricted. This is the phenomenon of compensatory growth.

In this example, cattle transferred as weaners have been assumed to grow from 20 months of age onward at an average rate of 1.4 lb per day; those transferred as yearlings at 1.45 lb per day; and those transferred at 20 months of age at 1.5 lb per day. Fig. 4 shows that the cattle transferred as yearlings will take approximately 57 days longer to attain the slaughter liveweight than those cattle transferred as weaners, and cattle transferred at 20 months of age will take 122 days longer. Most important from a practical point of view is that the last transfer group of steers will have to be kept for a third winter.

If, on the other hand, it is assumed that all the cattle will be killed before the third winter, the weight differences between the groups become of greatest importance. These practical facts must be considered also in relation to body composition and dressing-out percentages. In general the lifetime production cost of a meat animal is proportional to the area under the time-weight curve, and the differences between the three groups is shown in Fig. 4 by the shaded areas, but there is also the other, and equally important, factor to consider, namely the effects of these planes of nutrition, at different ages, on body composition and the yield of edible meat.

THEORETICAL TIME FOR STEERS TO ATTAIN A SLAUGHTER LIVEWEIGHT OF 1100 LB. WHEN TRANSFERRED FROM BREEDING COUNTRY TO FAT LAMB FARM AT DIFFERENT AGES.

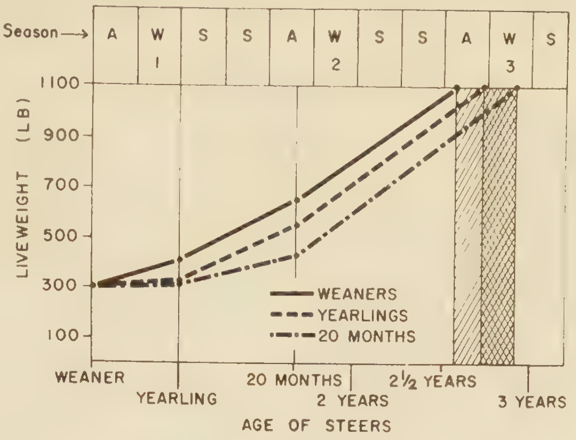

Fig. 4.

From this trial, which merely highlights well known practical facets of pastoral beef production, the obvious conclusion must be that steers bred on the hill, particularly if these are early weaned, should be transferred to the more productive fat lamb farm conditions immediately after weaning. Longer retention on the hill enforces a longer time to attain an economic slaughter weight (perhaps necessitating an extra wintering season), excessive fatness in relation to weight, and a poor yield of edible meat. Such a suggestion of an early transfer age, obviating the store period, integrates well with the recommended practice for hill country farmers to make more use of cows for scrub control instead of the old, heavy, uneconomic steer.

3. The influence of breeding

One further aspect of beef production in New Zealand that demands attention is the contribution of the national dairy herd. Though much has been said and done in the past about this topic, it remains one of the most vital aspects requiring urgent attention.

Some lessons can be learnt from the United Kingdom, where the tremendous increase in beef production since the end of the war can be almost directly related to the use being made of dairy-bred beef. In addition to

TABLE 3—LIVEWEIGHT FOR AGE OF STEERS TRANSFERRED FROM BREEDING COUNTRY TO FAT LAMB FARM AT DIFFERENT AGES

Transferred at		No. of	Wt. as			
Age	Wt. lb	steers	Weaner lb	Yearling lb	20 mths. lb	Wt. diff. lb
Weaner ..	301	25	301	406	650	—
Yearling ..	324	16	300	324	550	—100
20 months ..	432	27	297	317	432	—118

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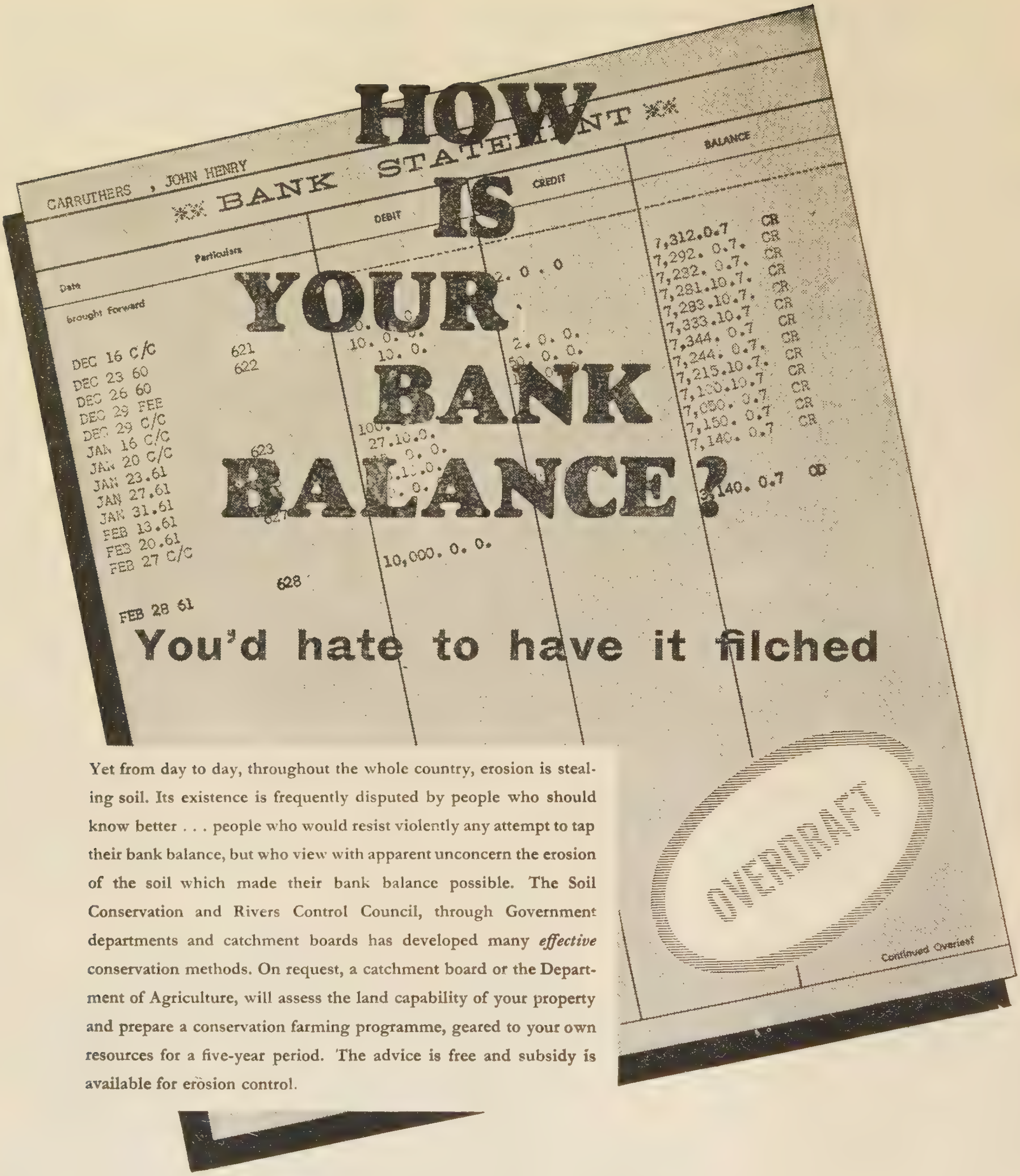

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Friesian and Jersey crossbred calves at 10 months reared by multiple suckling at Ruakura.

extensive use of beef bulls on dairy cows, accounting for about 40 per cent of all dairy cattle artificially inseminated, bull calves from purebred Friesians, now a predominant dairy breed in Great Britain, are used extensively in beef production. In a recent national British survey more than two-fifths of the milk-selling herds were Friesians and, next to the Hereford, the Friesian was the most widely used sire of those animals retained for rearing as beef on dairy farms.

From the farmer's point of view the Friesian steer is a useful beast, for it grows very fast. To the butcher it is also very acceptable; by virtue of its slow maturity it provides a high proportion of lean meat when killed at, say, 600 lb carcass weight.

From another recent survey in Great Britain 244 Friesian steers averaged 673 days to attain 591 lb carcass weight, or an average of 0.89 lb carcass weight increase per day. Such a figure compares favourably with the growth of purebred beef cattle.

What of the Friesian in New Zealand? Though Friesian dairy cows comprise only about 6 per cent of the total dairy herd, it can be calculated that if all the Friesian bull calves were reared to only 500 lb carcass weight, the total weight produced would be approximately 13,370 tons, of which 67 per cent, or 8,960 tons, would be useful edible meat.

Much has been stated recently about the French Charollais breed of cattle, with its rapid growth and heavy fleshing powers; the use of this breed for crossing with the Jersey may prove the saving grace of New Zealand dairy beef production.

Veal Production

In terms of veal production, the future is attractive. Many of the past difficulties of transporting young calf carcasses in the frozen state, with distinct possibilities of freezer burn due to lack of subcutaneous fat, are resolved when the product becomes boneless, packaged veal.

In New Zealand over 1¼ million calves are slaughtered annually at a few days of age. Table 4 summarises the yields of edible veal, fat, and bone from calves at three different weights.

TABLE 4—EDIBLE VEAL, FAT, AND BONE YIELDS OF CALVES

	Carcass wt.	Per cent of carcass wt.		
Age	lb	Edible veal	Fat	Bone, etc.
Bobby	30	59	2	39
4 months	100	62	2	36
10 months	200	65	3	32

A large number of calves could be profitably reared by bucket feeding or multiple suckling to, say, 16 to 20 weeks of age, producing a carcass weight of 120 to 150 lb lacking conformation but yielding valuable lean meat. Alternatively, these dairy-bred calves might be carried to, say, 8 to 10 months of age and slaughtered before paddocks were closed for autumn-saved pasture. In this case, a reasonable carcass weight might be 200 to 240 lb.

Table 4 shows that, compared with the bobby calf, a substantial increase in the yield of edible meat could be expected. If all Friesian bull calves were reared to 200 lb carcass weight, the total weight produced from these alone would approximate 5,300 tons, of which 65 per cent, or 3,445 tons, of edible meat would be added to the national larder.

A policy of non-castration of animals killed at light weights has much to commend it, for a bull weighing 200 lb carcass weight will yield approximately 2 to 3 per cent more edible meat and less fat than a steer of comparable weight.

An example of the present wastage of this potentially valuable meat is given by the results of an inspection at the delivery centre for bobby calves at Horotiu freezing works in August 1960. Out of 252 bobby calves entered during two hours, 84 were Friesians or of Friesian breeding, and most likely all would be bull calves. Here lies a great potential at present being disregarded.

The increasing use of Friesian sires in New Zealand today means that many Friesian-Jersey cross calves will be available for rearing to either veal or lightweight beef. These should be given a reasonable test of their adequacy to produce edible meat and should not be condemned because of the colour of their coat or conformation.

An important factor with dairy-bred beef is to slaughter at a light weight; carrying on to relatively heavy weights leads to excessive internal fatness in relation to weight.

Such thoughts as these are probably appropriate to the farmer faced with labour difficulties. Calf rearing, especially by multiple suckling, demands little labour and, if well managed, can prove profitable.

The problem of collecting suitable calves for rearing in large numbers is now being tackled by freezing works and dairy factories. No doubt much more will be heard of these commendable ventures. At the same time more research is required on simple economic means of rearing dairy-bred beef calves to either veal or lightweight beef.

◆

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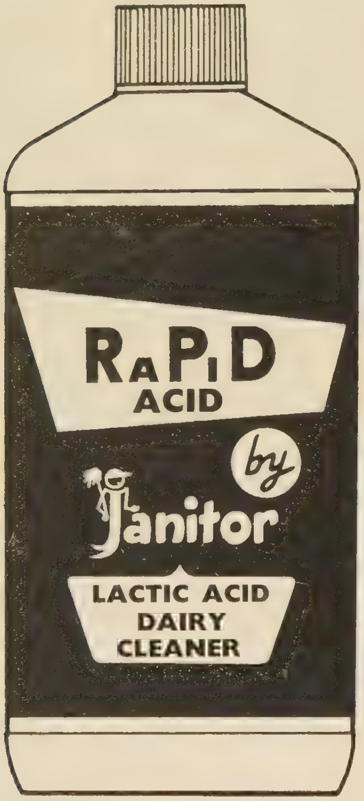

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Growing Bananas in New Zealand

By J. C. GERLACH,
Tropical Agronomist,
Department of Agriculture Rukuhia Soil Research
Station, Hamilton

[Ellis Dudgeon

Dwarf Cavendish banana grown in Nelson.

IN recent years Press articles and inquiries received by the Department have indicated public interest in growing bananas. Since the banana is essentially a tropical plant, it is considered useless to try growing it in New Zealand as a commercial proposition, particularly as the New Zealand island territories and also Fiji and Tonga can produce an abundance of this fruit at a much lower price. However, for those who have a warm sheltered position or a glasshouse on their property and who want to grow a banana plant as an ornamental or attempt to get the plant fruiting, this article may contain some useful information.

LONG before bananas became a commercial crop for the European markets they were one of the most important fruits used by most of the people living in the tropics. It is believed that the banana originated in southern Asia, where wild forms can still be found in the jungle.

In New Zealand the banana is very popular, imports of this cheap and wholesome fruit having increased to about 900,000 cases a year.

Botany

The banana is a member of the *Musaceae* family, and the genus *Musa*, to which all cultivated bananas belong, has from 60 to 80 different species. These are commonly subdivided into two main groups—the plantains (*Musa paradisiaca*), or cooking bananas, and the eating bananas (*Musa sapientum*). The former are the more starchy types, often containing some seeds, and require cooking before they are eaten as a vegetable or instead of taros or yams. In the eating bananas, which are seedless, more of the starch is converted to sugars during ripening, so that they have a sweet taste and are suitable to eat fresh as a dessert fruit.

The banana imported into New Zealand is the lacatan, a variety of the *Musa cavendishii*, a small group of eating bananas originating from southern China.

Bananas and plantains are large herbaceous plants with a short underground stem or corm. This corm has a large number of fairly short and fleshy roots and produces aerial shoots and leaves. The large leaves have a broad petiole or leafstalk, and these leafstalks, spirally arranged and fitting tightly round each other, form a slightly tapering cylinder called a pseudo-stem or trunk.

The plant produces 30 to 40 leaves in its lifetime; the last one before the emergence of the flower is a short one called flag-leaf. The flower stem grows from the corm, pushing through the centre of the trunk, so that the large red or purple flower bud emerges from the centre of the crown, usually bending down in a few days.

The flowers occur in double rows, placed spirally along the flower stem, each double row protected by a red or purple bract which is lifted and falls off as the flowers emerge and the "fingers" or "hands" of fruit develop in the bunch. Depending on the variety and conditions of growth, a bunch may contain five to 12 or more hands, each containing some eight to 24 fruit or fingers.

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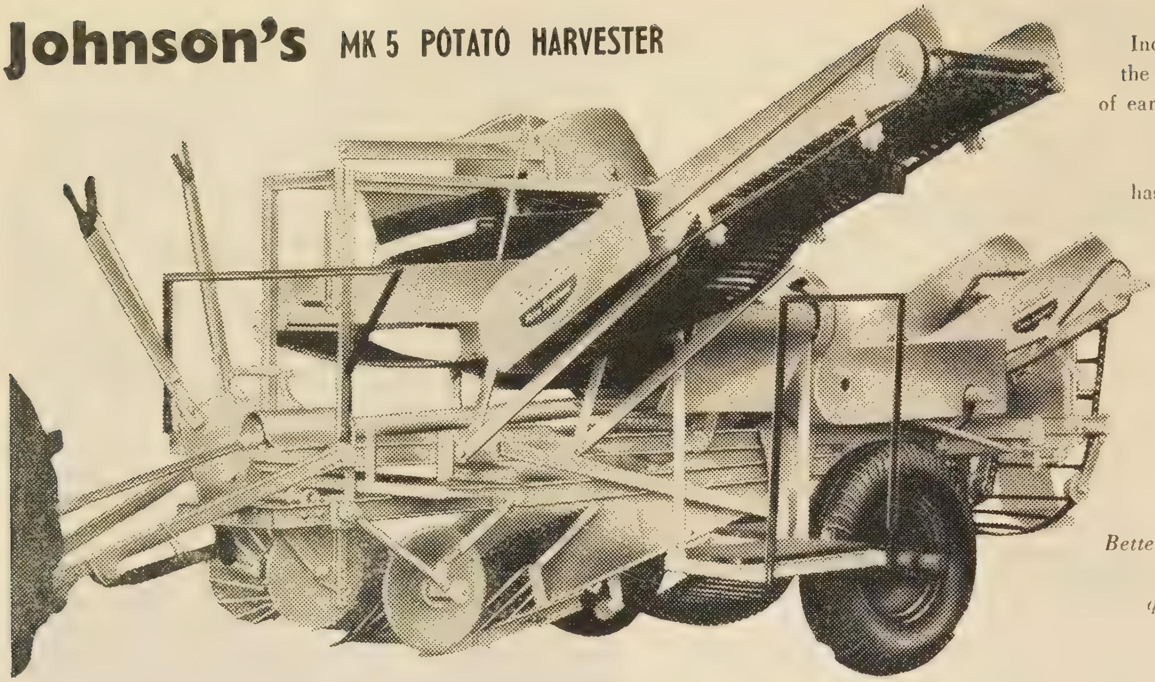

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Once the plant has thrown a bunch of fruit it dies; that is, the aerial part of the plant dies. In the meantime new shoots, which replace the mother plant, have grown from the corm, and if these are left alone, a cluster of plants (stool or clump) will be formed with stems of different ages which in turn can produce a bunch each.

Requirements

As the plant is shallow rooting and is not very firmly anchored in the soil, it cannot stand strong winds; the large leaves are also easily torn by the wind. The banana therefore needs a position sheltered from strong prevailing winds.

The plant can be grown in a fairly wide range of soil types, but it prefers a loose structured, well drained, fertile soil rich in organic matter. The phosphate requirement is not very high, but the banana is a gross feeder of potash and nitrogen, and an adequate amount of lime in the soil is needed.

The banana does best under moist conditions, with regularly spread rainfall throughout the year.

The most important factor, however, governing the possibility of growing bananas successfully in this country is the temperature. The most favourable average temperature for growth is about 80 degrees F, when four to five leaves per month are produced and the plant starts to flower in about eight to 10 months, the fruit bunch being ready two and a half to three months later. This is the position in the tropics with equable high temperatures combined with adequate rainfall and high humidity.

In New Zealand the situation is different, since the daily range in temperatures is greater than in the tropics and the average summer temperatures are lower. One has therefore to be guided rather by the minimum requirements for growth if planting of bananas is contemplated.

The banana is frost tender and it stops growing when the temperature drops below 60 degrees F. The suitability of a place for banana growing therefore depends on how often and for how long the temperature drops below that critical level, and especially if in those periods the temperature falls below freezing point.

Some varieties are more resistant than others to low temperatures. They include some plantains and a few eating bananas, such as the dwarf Cavendish, which is planted commercially in southern Queensland, Australia. However, a few degrees of frost or cold winds will cause injuries to leaves and young fruit.

Leaf Production

Leaf production is strongly influenced by the temperature, which can also considerably retard the shooting and maturing of the bunch. The temperature must rise to and be kept at an average of 60 degrees F before one to two leaves a month are produced. For a normal production of about four to five leaves a month, a minimum monthly mean temperature of 72 degrees F is required. A glance at the monthly isotherms for New Zealand (as shown in B. J. Garnier's "New Zealand Weather and Climate") shows that the latter situation does not occur in the Dominion, the mean temperature in the warmest months (January and February) being 65 degrees F in the warmest parts of the North Island. According to overseas literature, emergence of the bunch occurs in areas with equable temperatures at a mean monthly temperature of 72 degrees, but in areas with a greater daily range it occurs at a mean of 78 degrees (Mediterranean).

These figures show clearly that normal growth and production cannot be expected here and consequently the planting of this crop should never be considered as a commercial proposition.

A plantain-type banana grown in Kerikeri.

A hothouse would be required to attain normal growth, but because of the room required (10 to 12 ft space between plants) and the fact that only one bunch per plant is produced each year, tomatoes, vegetables, or ornamentals are obviously a far better proposition for commercial hothouses.

Out of doors leaf production at a rate of one or two leaves a month can be attained only in very favourable situations where mean temperatures exceed the New Zealand average for the warmer districts. Even there the plants cannot be expected to reach maturity within one year.

Experience shows that even under favourable conditions the plant takes two years or more to send out its flower bunch. Some plants more than four years old in the Waikato have never flowered, but have produced only one or two new suckers a year, while the old stem died in the second or third winter.

If conditions are more favourable and the plant does shoot a bunch, there are still a few factors to consider. The development and maturing of the bunch depend very much on the time of its emergence. The earlier the bunch emerges in the warm season the better the chance of maturing before the following winter.

Bunches emerging later than January do not develop to full size in the same season. If they are not affected by low temperatures or diseases, they may still grow out in the following summer, thus taking some eight to 10 months for full development. Protection by a plastic wrapping perforated at the bottom end may help to overcome low temperature injury of the young fruit.

Temperatures of 50 degrees F or below seriously reduce the quality of fruit that is in an advanced stage of development. The fruit of plantains often contains a large number of seed and has a high tannin content when produced under minimum conditions.

Propagating Material

Two types of plant material are normally used for propagation—suckers and parts of the rhizome (bits).

Suckers are the offshoots of the parent plant and are usually considered the best planting material. They should be taken at the "swordleaf" stage, that is, when the leaves have still a narrow blade and the sucker is 1 to 2 ft high. With a sharp knife they are severed from the mother plant with a piece of the rhizome not less than 3 in. in diameter. They are left for a few hours in the open, but out of the sun, to allow the wound to dry and are then planted.

Sections of the mature corm with a prominent, well developed bud or eye can also be used for plant material. They should have the eye centrally placed and be not less than 3 in. in diameter in any direction. In Australia bits are considered the best material for early plantings, since they give rapid growth and an even stand in the commercial plantations in Queensland.

Planting

From the temperature requirements for growth it follows that the best planting time is in late spring or early summer, when soil and air temperatures are sufficiently high to ensure continuous growth. Planting holes of about 18 in. deep and wide should be dug, the soil mixed with compost, and fertilisers, where necessary, added. The sucker or bit should be placed in the hole so that the top of the corm is a few inches below the surface, the soil then being firmed round the plant.

The recognised practice is not to fill the planting hole completely until later, thus leaving a depression at the planting position. This improves the moisture condition and allows for more compost or topsoil to be added later to ensure good development of the plant.

Fertiliser application depends on the type of soil and its fertility level. A fruiting banana plant requires the major elements nitrogen, phosphate, potash, and calcium in the ratio of 4 : 1 : 13 : 5. According to the soil in which the banana is planted, this mixture should be given at a rate of 3 to 6 lb per plant per year. To make up 3 lb of the mixture the following amounts of fertiliser are required: Sulphate of ammonia 1 lb 3 oz, superphosphate 5 oz, muriate of potash 1 lb 2 oz, and agricultural lime 6 oz.

To obtain big bunches, not more than one or two side shoots per year should be allowed to develop, the rest being pruned away.

Cultivation of the soil round the plant, if necessary, should be shallow so as not to damage the roots. Unless wet conditions prevail, the dead leaves and old trunks should be cut in pieces and placed as a mulch round the plant, forming a protection against dry summers and cold winters.

Pests and Diseases

Several diseases and pests can affect the banana. It pays therefore to start with healthy plant material and to inspect the plants regularly for symptoms. Advice on treatment of various diseases or pests is available from Horticultural Instructors.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of April 1962:

NORTH ISLAND

January

1 January—Nuhaka A. and P. at Nuhaka.

13 January—Waipu A. and P. at Waipu.

19 and 20 January—Wairoa County A. and P. at Wairoa.

*19 and 20 January—Feilding I., A., and P. at Feilding.

26 and 27 January—Horowhenua A. and P. at Levin.

*27 January—North Kaipara A. and P. at Paparoa.

31 January—Marton District A. and P. at Marton.

February

2 and 3 February—Rodney A. and P. at Warkworth.

3 February—Rangitikei A. and P. at Taihape.

*3 February—Katikati A. and P. at Katikati.

3 February—Woodville A. and P. at Woodville.

6 and 7 February—Dannevirke District A. and P. at Dannevirke.

*10 February—Pahiatua A. and P. at Pahiatua.

9 and 10 February—Taumarunui District A. and P. at Taumarunui.

10 February—Hukerenui A. and P. at Hukerenui.

14 February—Te Awamutu A., P., and H. at Te Awamutu.

16 and 17 February—Ohura A., P., and H. and I. at Nihoniho.

16 and 17 February—Franklin A. and P. at Pukekohe.

16 and 17 February—Masterton A. and P. at Masterton (75th Jubilee).

*17 February—Waiapu P. and I. at Ruatoria.

17 February—Opotiki A. and P. at Opotiki.

19 February—Northern Wairoa A. and P. at Mititai.

20 February—Otorohanga A. and P. at Otorohanga.

21 February—Te Kauwhata A. and P. at Te Kauwhata.

23 and 24 February—Te Kuiti A. and P. at Te Kuiti.

23 and 24 February—Wellington and Hutt Valley A. and P. at Trentham.

*23 and 24 February—Mangonui County A. and P. at Kaitaia (75th Jubilee).

24 February—Waimarino A. and P. at Raetihi.

24 February—Te Puke A. and P. at Te Puke.

24 February—Putaruru District A. and P. at Putaruru.

March

1 March—Morrinsville A. and P. at Morrinsville.

*3 March—Matamata A. and P. at Matamata.

3 March—Whakatane A. and P. at Whakatane.

5 March—Waiotira Junction at Waiotira.

10 March—Kumeu A. and H. at Kumeu.

17 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

January

13 January—Blueskin A. and P. at Waitati.

13 January—Wallace A. and P. at Otautau.

20 January—Waikouaiti A. and P. at Waikouaiti.

20 January—Waiau A. and P. at Tuatapere.

*27 January—Peninsula Horse and A. and P. at Duvauchelle.

27 January—Palmerston and Waihemo A. and P. at Palmerston.

30 and 31 January—Otago A. and P. (South Island Championships) at Dunedin.

February

3 February—Golden Bay A. and P. at Takaka.

*3 February—Whataroa A. and P. at Whataroa.

3 February—Banks Peninsula A. and P. at Little River.

10 February—Inangahua A. and P. at Reefton.

17 February—Murchison A. and P. at Murchison.

17 February—Maniototo A. and P. at Ranfurly.

23 February—Central Otago A. and P. at Omakau.

24 February—Buller A. and P. at Westport.

*24 February—Kaikoura A. and P. at Kaikoura.

March

*3 March—Temuka and Geraldine A. and P. at Winchester.

3 March—Amuri A. and P. at Rotherham.

3 March—Rai Valley A. and P. at Rai Valley.

10 March—Cheviot A. and P. at Cheviot.

*10 March—Mayfield A. and P. at Mayfield.

10 March—Mt. Benger A. and P. at Roxburgh.

13 March—Lake County A. and P. at Lake Hayes (near Arrowtown).

17 March—Hawarden A. and P. at Hawarden.

17 March—Upper Clutha A. and P. at Wanaka.

*17 March—Flaxbourne A. and P. at Ward.

31 March—Methven A. and P. at Methven.

April

7 April—Oxford A. and P. at Oxford.

14 April—Malvern A. and P. at Sheffield.

23 April—Mackenzie County Highland Show at Fairlie.

*23 April—Strath-Taieri A. and P. at Middlemarch.

* The Department of Agriculture exhibit will be staged at this show.

LIMING IN NEW ZEALAND

By C. DURING, Senior Scientific Officer, Department of Agriculture, Wellington

LIME requirements in Canterbury, Westland, Marlborough, and Nelson are considered in this article, which is the second of four articles in which the use of limestone will be discussed district by district. In last month's "Journal" liming in Southland and Otago was dealt with; recommendations for North Island districts will be presented in the January and February issues.

Liming in Canterbury

THE arable land of Canterbury consists of a coastal plain which in the north and south is terminated by moderately large areas of rolling downs. In the west the plains end more abruptly against a narrow strip of downs or against steep foothills. These plains and arable downland soils occupy 2½ to 3 million acres and consume all but a very small proportion of the lime used at present.

Most of these soils have been derived from greywacke, the rock which formed the mountains of the main divide. Fresh deposits of river silt or windblown loess derived from greywacke are quite fertile and do not respond much to liming or to molybdenum. With moderate age and the associated weathering and leaching, however, these soils derived from greywacke materials, whether stony or consisting of deep silt, need lime to grow good pastures and crops and commonly are deficient in molybdenum.

The benefit of liming in Canterbury was illustrated in 1930, when A. W. Hudson and A. Y. Montgomery summarised the results of some 200 topdressing experiments carried out from 1928 to 1930. They wrote in the November 1930 issue of "The New Zealand Journal of Agriculture":

> Hitherto lime has not been viewed as an important limiting factor to the production of pasture in Canterbury. These experiments show only 5 per cent of cases where there is "no visible response".
>
> . . . . .
>
> The importance of the lime plus super combination in connection with the establishment and maintenance of pastures of short or long duration cannot be stressed too strongly. Experience indicates that ryegrass responds almost as well as clovers, if not quite as well, to the addition of lime to soils deficient in it. . . .

It must be noted that at the time these experiments were conducted

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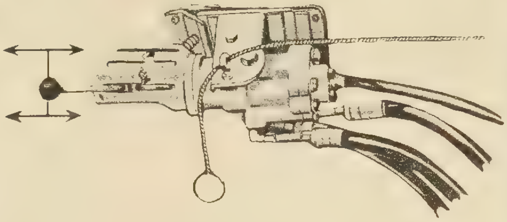

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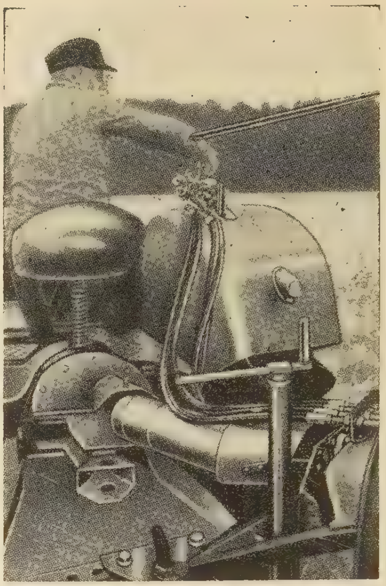

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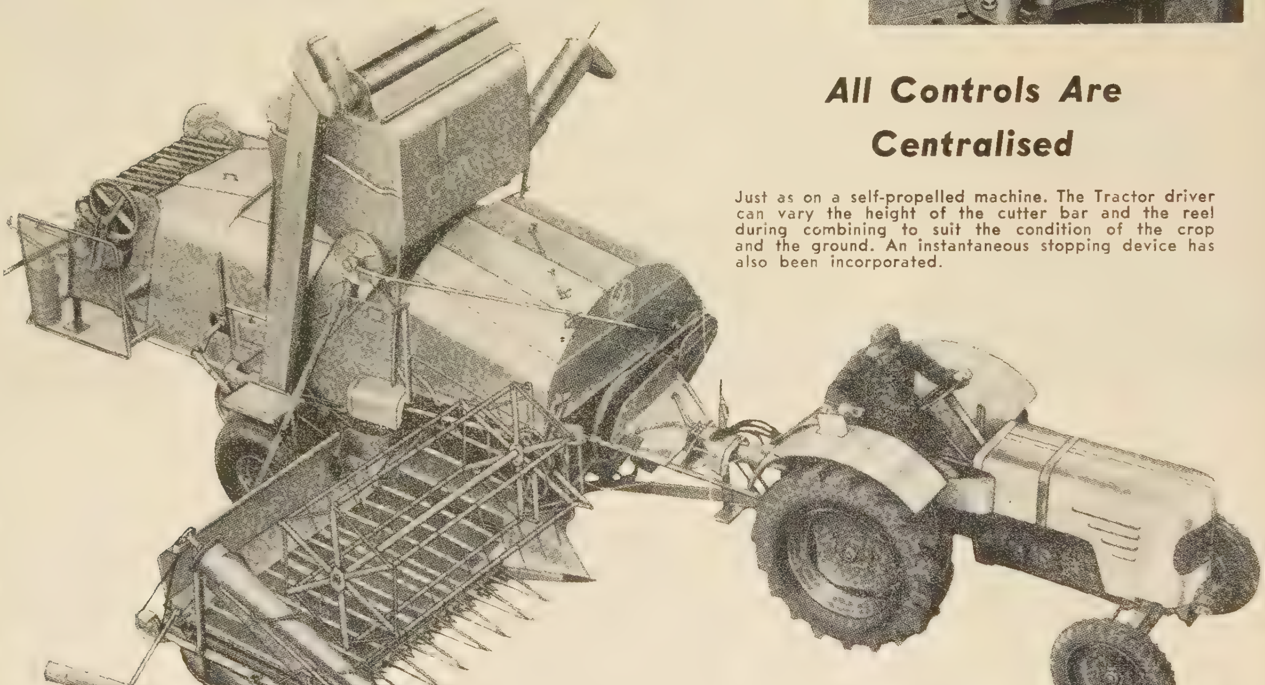

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Canterbury grew mainly "false perennial ryegrass", which did not last much longer than one to two years. Better results still were expected from true perennial ryegrass. Hudson and Montgomery also found that the duration of the effect of 1 ton of lime per acre was at least five to six years. The effect of lime was sometimes visible within four to five months after application and was generally more marked in the second than in the first year.

These statements were made over 30 years ago. In the last 10 years the discovery of molybdenum deficiencies in Canterbury has led to some modifications in the advice given on rate of liming or on the desirable pH necessary to grow good pastures on individual soil types.

For the purpose of this discussion on lime requirements Canterbury can be divided into four groups of soils.

1. Arable soils on which the amount of limestone needed has not been affected by molybdenum.
2. Arable soils on which molybdenum should be applied with a corresponding saving in lime.
3. Hill soils, high country soils, and very droughty soils on which the combination of lime and molybdenum may be best, but where for economy molybdenum is used mainly.
4. Soils on which pasture and crops (with the possible exception of lucerne and some market garden crops) do not respond to liming.

Soils on which the amount of limestone needed has not been affected by molybdenum

These soils fall into two classes; one is slightly deficient in available molybdenum in the unimproved stage, the other is not. The soils which are slightly deficient in available molybdenum while unimproved and unlimed are the most important.

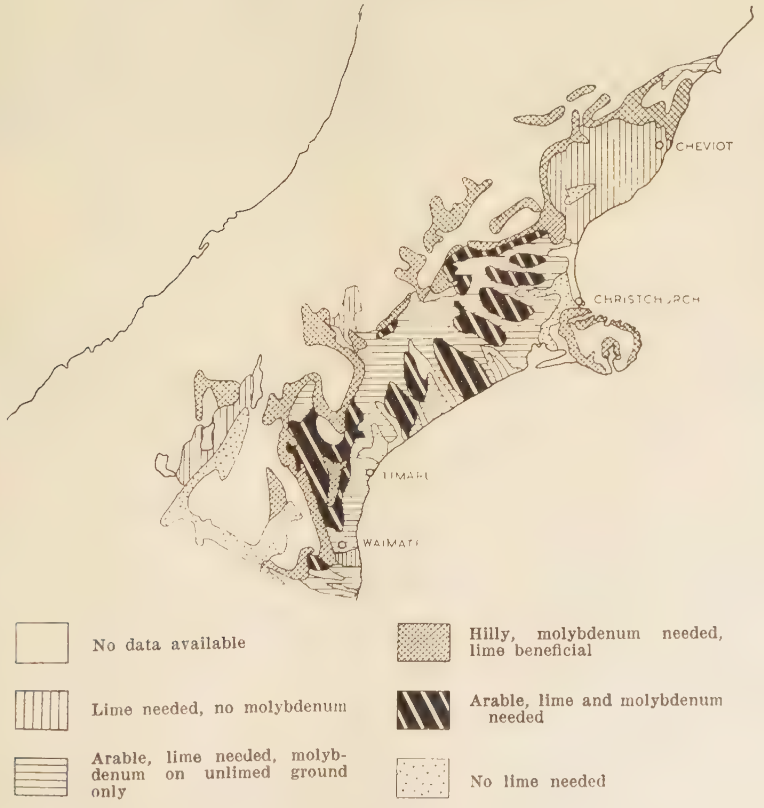
They consist of the more fertile coastal downlands and many of the more fertile coastal plain soils derived from water- or wind-deposited silt of greywacke origin. The Timaru silt loam of South Canterbury is typical of the downland soils. In its unimproved state it is moderately acid, about pH 5.3-5.4, and deficient in available molybdenum.

Other Soil Requirements

READERS should bear in mind that articles in this series deal specifically with lime needs. Other soil requirements, though important, are seldom mentioned.

Though farmers' main interest will naturally be in the sections on their own districts, they are advised to refer also to the introductory section in the first article (November), because this discussed aspects of liming which have general application.

Lime and Molybdenum Requirements for Pastures, Canterbury


CHEVIOT
CHRISTCHURCH
TIMARU
WAIMATE
☐ No data available
▥ Lime needed, no molybdenum
▤ Arable, lime needed, molybdenum on unlimed ground only
▒ Hilly, molybdenum needed, lime beneficial
▧ Arable, lime and molybdenum needed
⁘ No lime needed

As soil acidity is reduced to a more desirable level of about pH 6.0 to 6.2 molybdenum deficiency disappears, except perhaps in lucerne and on paddocks which have been exhausted by long and consistent cash cropping.

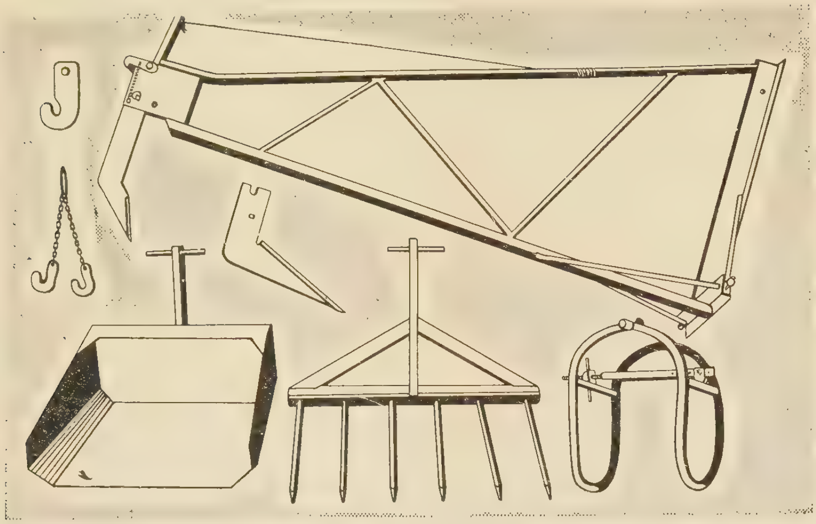
On the plains the young soils such as the Templeton, Wakanui, and Temuka soils behave similarly to the more fertile soils of the downs. This group includes also soils of quite different character; for instance, the freely drained, stony, bouldery soils near or in the foothills receiving about 40 in. of rainfall per annum. The Ruapuna bouldery silt loam is typical of these.

On all these soils initial rates of application of limestone on cultivated land should be in the vicinity of 1 to 1½ tons followed by maintenance dressings of 1 ton of limestone per acre every six to eight years. There are close to a million acres of soils which fall into this group, where slight molybdenum deficiency of initially moderately acid soils is usually eliminated by liming to about pH 6.0.

There are also considerable areas of soils on which pastures and crops respond to lime, but not apparently to molybdenum, while the soils are still unimproved.

In this group are some of the most fertile soils of the plains formed on relatively recently deposited river silts and sands. The Waimakariri soils are a good example. Many of the North Canterbury soils which have been influenced by lime-rich parent materials also belong here. These soils do not suffer from a very marked lime deficiency, but the use of lime is nevertheless considered highly payable.

Much more strongly lime deficient, but not proved responsive to molyb-



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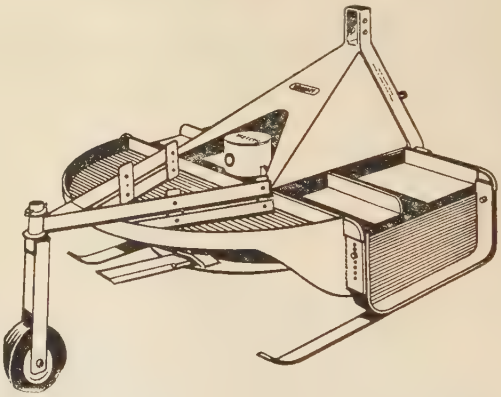

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In Canterbury liming is an essential step toward farming prosperity.

denum, is a small number of soils near or in the foothills, occurring under a rainfall of about 40 in., and closely related to soils which are strongly molybdenum responsive. Oxford silt loam is an example.

Finally the peats and peaty loams need lime but not molybdenum.

Arable soil on which molybdenum should be applied with a corresponding saving in limestone

In Southland and Otago the downs soils occurring under an annual average rainfall of 30 to 40 in. with slow-draining mottled subsoils suitable for mole ploughing typify the strongly molybdenum-responsive soil on which the use of this micro-nutrient allows successful arable farming at a soil pH of about 6.0 instead of about pH 6.5 necessary without it.

In Canterbury the inland downs near the foothills carry closely related soils. The Opuha, Kakahu, and Okuku silt loams are examples. On at least part of the arable portion of these soils the relationship of lime and molybdenum is similar to that on the downs soils of coastal Otago.

Large areas of the light lands of the plains, Lismore stony silt loam being an example, are also often strongly molybdenum deficient in their unimproved state. It is believed that some lime can be saved on part of these soils by the use of molybdenum. The total area of downs and plains soils in this group probably does not exceed 400,000 acres.

Since a large proportion of this land is not yet fully developed, and since molybdenum has helped to speed up development, it is considered that use of lime is not being adversely affected by molybdenum. In addition on pastures on the light lands of the plains fairly low concentrations of copper in pasture have been found by several chemical analyses. Care is therefore advised in the use of molybdenum, since a rise in the concentration of molybdenum in the pasture accentuates copper deficiency if the copper content is already low. There is no evidence that molybdenum applied at the recommended rates has harmed stock.

On ploughed land on the inland downs up to 2 tons of lime per acre is recommended, and on the light plains soils about 1 ton. Maintenance requirements for lime are estimated to be about 1 ton of lime per acre every four or five years on the inland downs and 1 ton per acre every six to eight years on the light lands.

Soils on which the combination of lime and molybdenum may be best, but where molybdenum only can be used

This group of soils covers very large areas. In the east it includes that part of Banks Peninsula covered by loess (Pawson soils); it includes also some of the most droughty soils of the plains, where costs have to be kept low (very stony Lismore soils). But lime is

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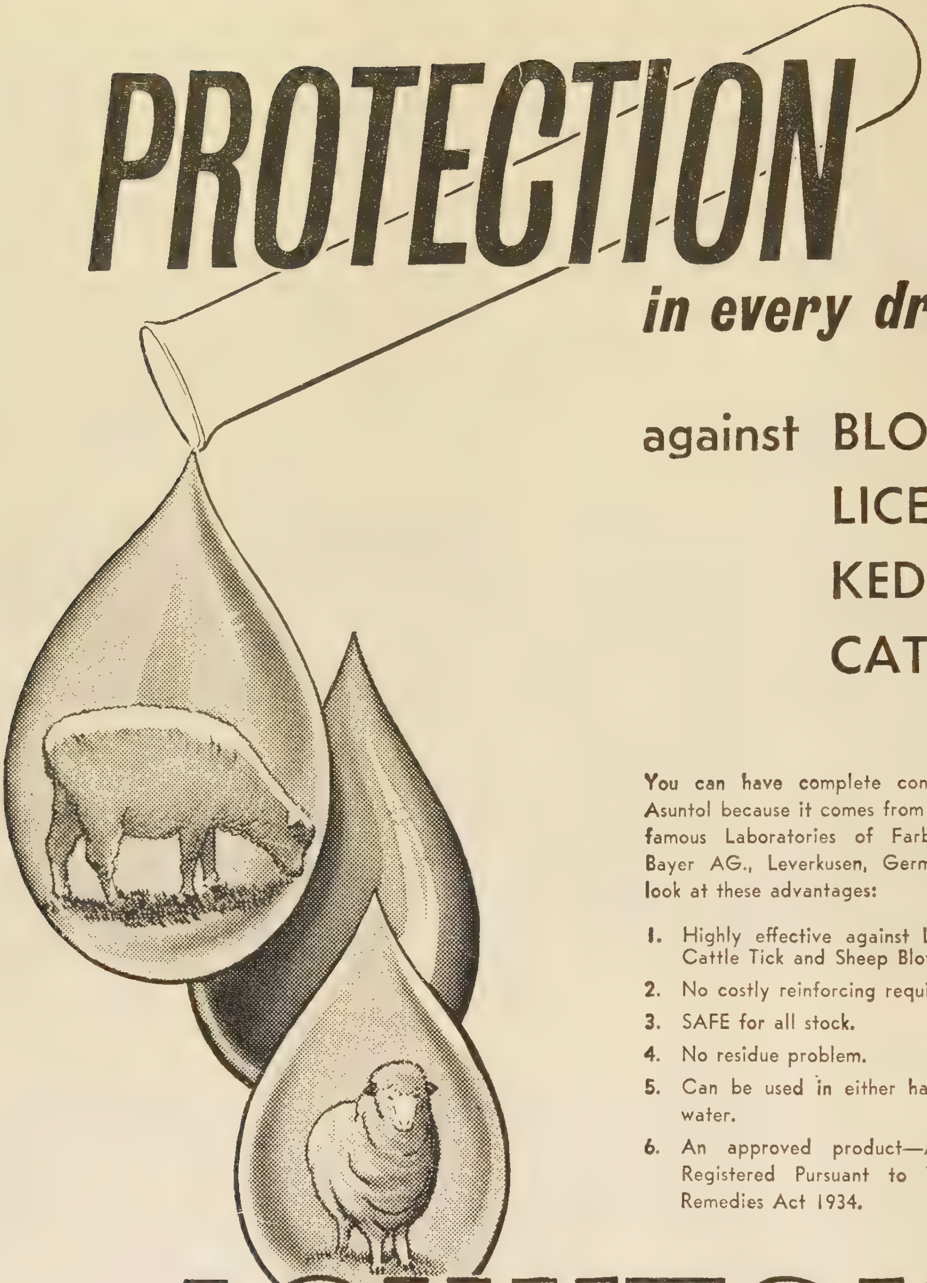

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commonly used even on the most droughty soils.

The group also covers nearly all the hilly parts of Canterbury. The exceptions are some of the hill soils in North Canterbury which are either influenced by limestone or are very dry, little leached, and fertile.

The potential demand for lime on the molybdenum-deficient marginal and hill country is difficult to estimate. It is probably small, because potential production is severely limited by summer droughts and because quite good clover growth can be obtained without lime. Compared with hill soils in coastal Otago the soils of the hills, foothills, and more accessible mountain slopes of Canterbury are generally less acid and more fertile.

In spite of its large area this group of soils therefore does not need to be considered as an important potential consumer of limestone.

Soils which do not respond to lime

These occupy only small areas. On the plains some of the most recent and richest river deposits and in the foothills some of the soils derived from loess which is still accumulating do not appear to need lime for the growth of pastures and crops, though they may need lime for lucerne growing. There are also scattered pockets of soils derived from limestone on which liming is not recommended. In addition in the dry inland valleys, such as Hakataramea, the value of liming is problematical.

Long-term Lime Needs of Canterbury

In the 30 or so years since A. W. Hudson and his colleagues carried out their liming trials in Canterbury great progress has been made.

Evidence suggests that on virtually all improved land of Canterbury pH 6.2 is adequate—with molybdenum on some soils, but without it on most. However, it is only for the last few years (since the Department of Agriculture began its present soil testing service for farmers) that many paddocks have been tested for pH. The result indicates that a large proportion of farmers who have limed regularly might have over-estimated the maintenance requirements of their soils. This position also applies, of course, to other parts of New Zealand.

On the other hand many parts of Canterbury are still underdeveloped and there is, or should be, a considerable demand for lime on farms on which management is being intensified.

The present position therefore appears to be that on many farms maintenance dressings of lime can be postponed for some years while on others soil acidity might well be reduced by larger applications of limestone. Only a soil test can tell the present need for lime on individual paddocks. Once the soil pH has been determined it is usually possible to outline a liming programme for many years ahead.

The long-term requirements for the 2½ to 3 million acres of arable land in Canterbury are probably about 350,000 tons of limestone per year.

Liming in Marlborough

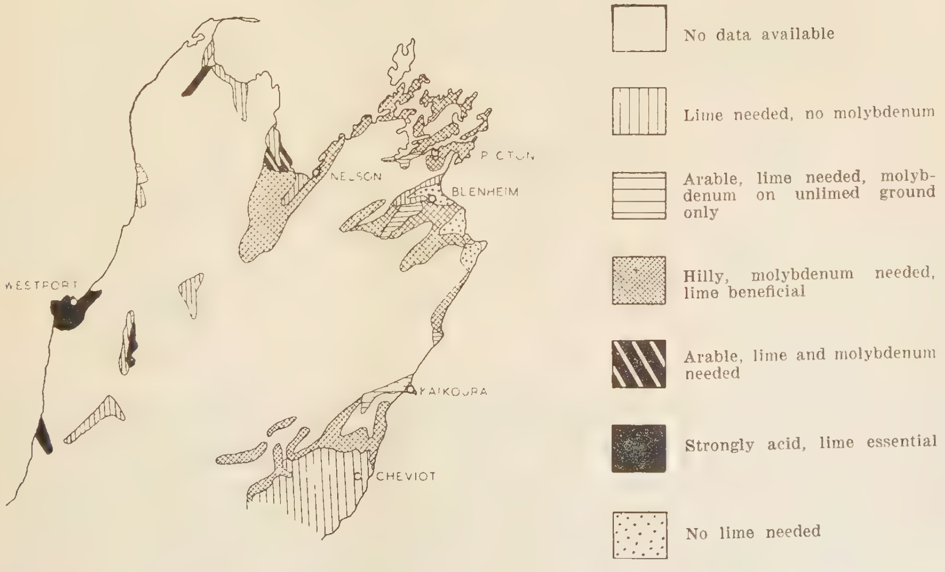
The total area of arable land in the lowlands of Marlborough is probably about 200,000 acres. This land is situated in a few river valleys. The main valley, that of the lower Wairau River, though a little warmer, has a climate and a rainfall similar to coastal Mid Canterbury's. Very much higher rainfall occurs of course in the Sounds country, but there the areas suitable for liming are limited.

Marlborough is also similar to Canterbury in the type of arable soils. Except on the most fertile soils of the alluvial flats, such as Wairau sandy loam and the Opawa sandy loam, liming is necessary.

On the soils on which liming is economically feasible a reduction in acidity to pH 6.0-6.2 would be advisable when the soils are improved from their unlimed state. Since the original soil reaction is usually only moderately acid (pH 5.3-5.8), 1 ton of lime per acre is regarded as adequate for the initial corrective dressing. Maintenance is estimated to be in the vicinity of 1 ton per acre every seven to 10 years on the main areas devoted to mixed farming which receive an annual average rainfall of less than 30 in. More frequent applications of lime will be needed in the higher rainfall districts such as Kaikoura and the Sounds.

As in other districts of the South Island there is evidence that many farmers are using too much lime and that an equal or perhaps greater number are using too little. The Department of Agriculture's Farm Advisory Officer at Blenheim, J. P. Beggs, estimated two years ago that 40,000 to 50,000 acres could

Lime and Molybdenum Requirements for Pasture, Marlborough, Nelson, Westland


NELSON
PICTON
BLENHEIM
WESTPORT
KAIKOURA
CHEVIOT
No data available
Lime needed, no molybdenum
Arable, lime needed, molybdenum on unlimed ground only
Hilly, molybdenum needed, lime beneficial
Arable, lime and molybdenum needed
Strongly acid, lime essential
No lime needed

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do with more lime than they receive. On the other hand many regular users of lime in the Wairau and neighbouring valleys are topdressing with 1 ton of lime per acre every three to five years, which is more than the estimated maintenance requirements.

It should again be stressed that a soil test determining the pH of individual paddocks is a valuable guide to the liming needs of a farm. If full use were made of professional advisory services, the annual lime consumption for Marlborough would probably be in the vicinity of 25,000 tons per annum.

Liming in Nelson and Westland

THE Nelson Land District consists of two rather dissimilar areas: one is the Tasman Bay area with an annual rainfall ranging from below 40 in. to just above 50 in.; the other is the west coast area including Takaka, Collingwood, Karamea, Murchison, and Westport districts, all of which receive 60 in. per annum or over. These west coast districts in many respects are similar to Westland to the south and are here included with Westland under the heading "West Coast of the South Island".

Tasman Bay Area

The Tasman Bay area consists of about 80,000 acres of flat land, mainly river flats, and of a similar area of undulating and rolling land much of which can be cultivated. The remainder is steep to hilly.

Much of the flat or easily undulating land of Tasman Bay is in orchards small fruit, hops, and tobacco. Some of the rolling land is occupied by exotic pine forests. The area on which lime can be applied easily is therefore rather small, probably about 140,000 acres, much of which is not yet properly developed.

Good Responses from Lime

In Nelson liming has not received the attention it deserves. On the 80,000 acres of rolling country which consists mainly of soils derived from greywacke gravels, pastures and crops respond extremely well to lime and molybdenum. According to R. Inch, Fields Instructor at Nelson, there is scarcely a farm in the Nelson district on which the amount of lime (and superphosphate) used could not be profitably increased. This statement applies of course only to the major soil types on which lime is needed. There are a few soils on which lime is not needed.

The maintenance requirements for limestone to keep the soils above pH 5.8 to 6.1 in the Tasman Bay area are about 1 ton of limestone per acre every five years. The long-term use desirable for the Tasman Bay district would be about 25,000 tons of limestone per annum.

West Coast of the South Island

The west coast of the South Island from Golden Bay in the north to the Haast River in the south covers a large area, but one with little land suitable for farming under the extremely wet conditions. Except in small parts of the Takaka area the average annual rainfall is above 70 in. In many parts it is 80 to 120 in. and over.

This high rainfall leads to very rapid soil deterioration. Nutrients are washed out, the soil acidity is increased, and the soil structure is damaged beyond repair within a relatively short time. Many of the terrace and downs soils which in a slightly drier climate would have excellent potential have an iron or clay pan which impedes drainage. Drainage, however, is all important on the west coast. Some of the older terrace and down soils lie on cemented gravel beds of such thickness that downward drainage does not occur and would be most difficult to obtain even by the use of heavy machinery.

The best soils are therefore the very recent soils from river alluvium which have not yet formed pan and the very stony soils which have remained free draining and which in most districts would be considered too droughty for intensive farming. Nearly all these soils are acid, with pastures and crops requiring lime. An initial dressing of 1 to 2 tons per acre and maintenance dressings of about 1 ton per acre every three years are recommended.

There may be 100,000 acres of reasonably well drained river flats, but about 200,000 acres of slow-draining soils of this type. The latter occur mainly in the southern part of Westland, are rather isolated, and are partly in bush.

The area of well drained stony terraces which could be farmed intensively is about 60,000 to 70,000 acres. Some of it is undeveloped, but a small proportion is farmed well. There are another 50,000 to 80,000 acres of coastal sand and terrace soils which are well worth farming, at least on the ridges.

Finally there are about 300,000 to 350,000 acres of flat and undulating land, the pakihi soils, which have very poor drainage qualities and which on the whole cannot be broken in economically today.

In all, therefore, along the whole length of the west coast from Takaka to Jacksons Bay there might be 200,000 to 300,000 acres of land which will repay adequate liming. Some 70,000 to 100,000 tons of limestone annually would be required.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during September 1961 and for the two months ended 30 September 1961 with comparative figures for the same month and the two months of 1960 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage increase
September 1961	19,517	307	19,824	—
September 1960	18,965	342	19,307	—
Increase or decrease	+552	—35	+517	+2.677
2 months ended 30/9/61	32,168	460	32,628	—
2 months ended 30/9/60	31,265	513	31,778	—
Increase or decrease	+903	—53	+850	+2.675

Butter in store at 30 September 1961 was 10,599 tons

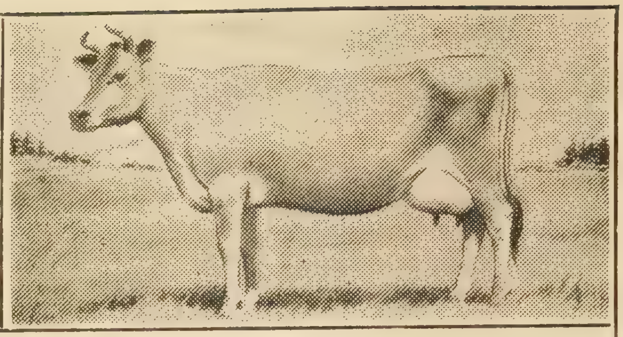
CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage decrease
September 1961	6,297	2,131	8,428	—
September 1960	6,844	1,764	8,608	—
Increase or decrease	—547	+367	—180	—2.091
2 months ended 30/9/61	8,153	2,551	10,704	—
2 months ended 30/9/60	9,714	1,918	11,632	—
Increase or decrease	—1,561	+633	—928	—7.978

Cheese in store at 30 September 1961 was 8,138 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.167 per cent in butterfat graded for the two months as compared with the preceding season. The above figures refer only to butter and cheese graded for export and do not include butter and cheese used on the local market and other products such as anhydrous milk fat, whole milk powder, and other whole milk products, and are not necessarily a true indication of production trends.

Protect the health and wealth of your stock



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"50"	Green	
"100"	Bright Red	
* "500"	Dark Red	

* (available on prescription only)

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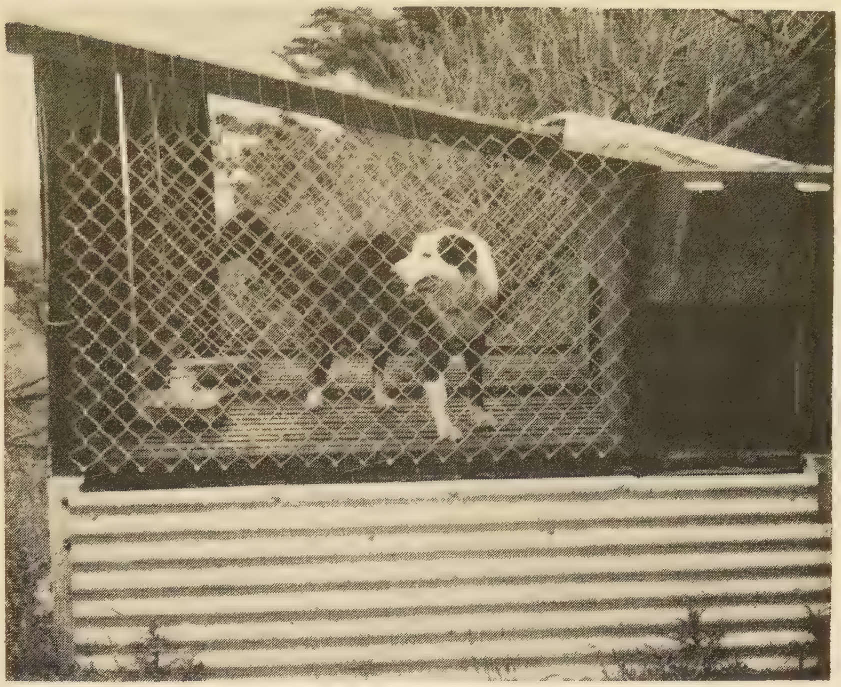
Common Diseases of New Zealand Farm Dogs

By D. O. CORDES*,
Veterinary Research Officer,
Department of Agriculture
Ruakura Animal Research Station

DISEASES from which dogs may suffer are extremely numerous. Some may merely affect the dog's ability to work; others affect its general health as well. Dogs are also responsible for transmitting some human diseases in this country.



There is no better protection for the dog's health than good housing.

NERVOUS symptoms occur in many dog diseases. Usually these do not point definitely to any particular disease, but if they are carefully studied they may sometimes do so. Partial or complete blindness, variable degrees of paralysis of one or more legs, twitching muscles, hysteria, convulsion, and coma are some of the things which may represent nervous symptoms. In some of these there may be intervals of relatively normal behaviour with successive attacks.

Infectious Systemic Diseases

Infectious systemic diseases may be defined as those in which living bacteria or viruses enter the body at some time, infect the bloodstream, and localise in one or many body organs. The following symptoms may be observed: fever, sweating, lethargy, depression, vomiting, collapse, or loss of appetite. These symptoms are the first which may be seen in most infectious diseases, and it is worth while being on the watch for any of them. As a disease progresses other symptoms develop and are usually characteristic of the disease. Infectious diseases tend to affect many dogs of a pack, but sometimes only one is affected.

The infectious diseases distemper and hepatitis affect only the dog; leptospirosis, toxoplasmosis, and streptococcal infections affect other animals as well

Canine Distemper

Canine distemper is the best known virus disease of dogs and was once the greatest killer of them, but widespread vaccination against it has considerably reduced its incidence.

Pus about the eyes and nose is a well known symptom. This may be followed by prolonged illness with any or all of the following: pneumonia, vomiting and diarrhoea, skin rash, and nervous symptoms. If a dog recovers from distemper, it is often left with a weakened constitution or nervous defects, and the ability of a previously capable dog is reduced partially or completely.

Treatment of the developed disease is not very successful. At best one can hope, with the use of antibiotics and good nursing, to control the secondary bacterial infections which occur in the complications and to attempt to reduce the side effects with other drugs.

All dogs should be vaccinated against distemper when three to six months old, one vaccination providing, for most practical purposes, life-long immunity. Even the less valuable dog ought to be vaccinated, because if it contracts the disease it will be a potential danger to all others with whom it comes in contact. A valuable dog should be revaccinated when it is five years old to boost its immunity.

Active vaccination does not give immediate immunity; at least 14 days elapse before there is any worthwhile protection. Immediate immunity for dogs in contact with the infection or for non-vaccinated dogs going to trials may be achieved by a dose of hyperimmune serum, which gives useful protection for about six weeks.

Infectious Hepatitis

Infectious hepatitis, another virus disease, has been recognised as a specific disease only for about 12 years, though undoubtedly it has occurred for a long time. This disease is probably widespread in New Zealand, many dogs contracting the infection but showing no symptoms and becoming completely immune. The symptoms are not striking, are variable, and may be confused with those of distemper.

IMPORTANT POINTS

- The well fed, adequately housed dog is exposed considerably less to risk of poisonings, infectious diseases, internal parasites, eczema, and injury than is his less well fed, roaming counterpart.
- Infectious diseases tend to affect younger dogs and groups of dogs; poisoning tends to occur in dogs of any age and usually in only one dog in a pack.
- Nervous symptoms are a feature of many dog diseases.
- The symptoms of many dog diseases are similar, and their diagnosis requires the services of an experienced veterinarian and, not infrequently, the laboratory.

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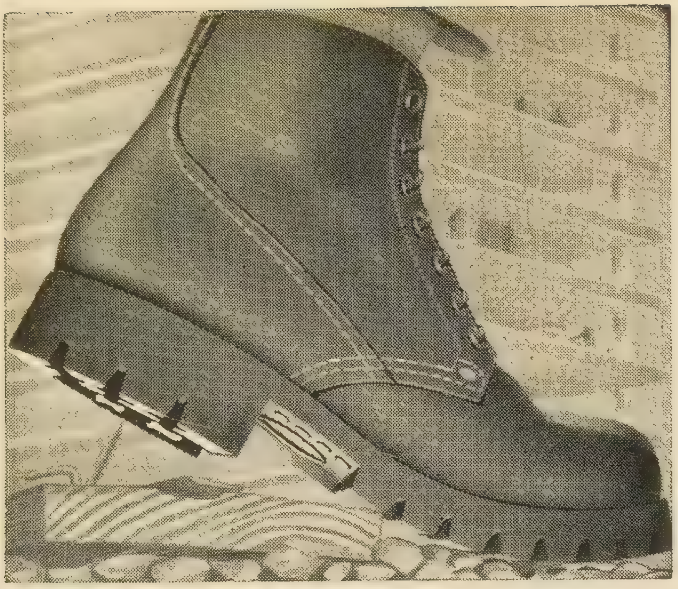
* Adapted from a paper he gave at the 1961 Ruakura Farmers' Conference.



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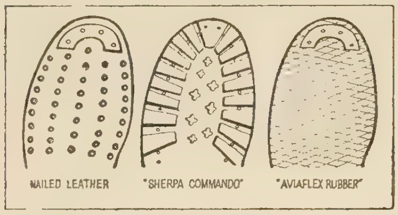

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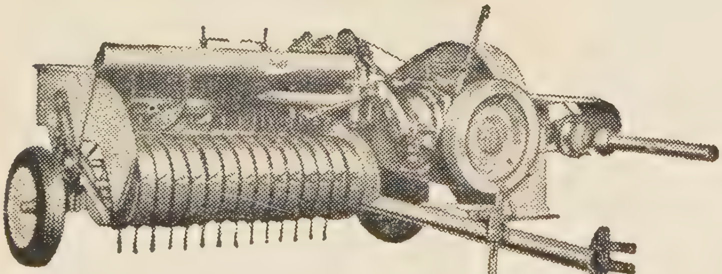

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There is a rapidly fatal form, most common in dogs under nine months old, from which dogs die in a few hours without previous indications of illness. Their rapid death leads the owner to suspect poisoning.

The acute non-fatal form and milder forms may be accompanied by slight jaundice and blood-stained discharges from the anus, the sheath, or vagina, from the stomach if the dog vomits, or from the lungs if it coughs. Mild convulsive seizures can occur, but these are not as serious or severe as those in distemper.

Dogs can be protected against canine hepatitis by active immunisation. Two inoculations a fortnight apart and then an annual booster dose are necessary. Immediate protection for six weeks can be gained by a dose of hyper-immune serum which is produced to protect against distemper as well.

Leptospirosis and Toxoplasmosis

Leptospirosis and toxoplasmosis, two further infectious diseases, occur in dogs of any age. Because of difficulty in diagnosis the incidence of infection of each is unknown, though each is suspected to be quite widespread. Each disease affects man and animals, but many infected dogs probably show few or no symptoms.

Leptospirosis has caused deaths of some dogs immediately after infection and probably many dogs die from chronic effects after months or years. The disease is contracted from contact with the urine of an affected animal.

Nervous symptoms and pneumonia occur in **toxoplasmosis** and consequently it may be confused with distemper. The means of transmission is not known.

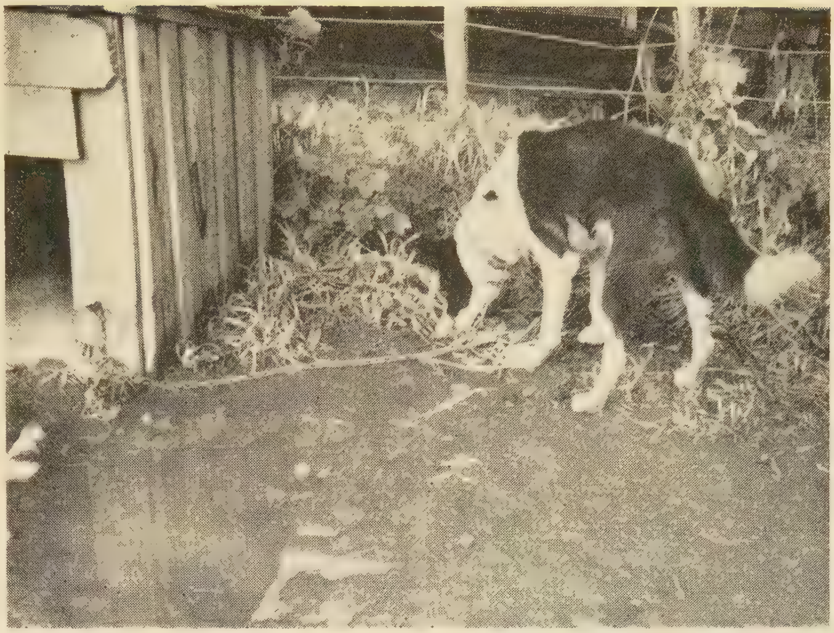
No specific method of prevention is available for either of these diseases in this country.

Streptococcal Infection

Streptococcal infection appears to be quite widespread in dogs, and the symptoms produced depend rather on which organ or system of the body is affected by the bacteria. There is no method of preventing infection, but penicillin is useful in treatment. Streptococci are sometimes associated with death in newly born pups.

Poisoning

Perhaps the greatest hazard to the health of working dogs is the numerous poisonous substances to which they have access about the farm. How dangerous a poison is to dogs depends directly on how accessible it is. Of the cases of poisoning identified from specimens sent to the Ruakura Diagnostic Centre over the past six years 48 were attributed to lead, 41 to strychnine, 11 to ANTU, nine to dieldrin and similar insecticides, six to phosphorus, four to arsenic, two to warfarin, and one to 1080. The figures do not represent the total poisonings of dogs in any area, but they do give an indication of the relative incidence of various types of poisoning. Poisonings are inclined to affect only one dog of a pack.



A dog likes to be reasonably clean in its habits. It will not defecate round its kennel; if chained up for days, it will become constipated.

According to the symptoms produced in affected dogs, these poisonings may be arranged in two broad groups: those which affect the nerves and those which affect breathing.

Poisons Producing Marked Nervous Symptoms

Nervous symptoms occur in poisoning by lead, arsenic, strychnine; insecticides of the group represented by DDT, dieldrin, and BHC; and 1080. These symptoms are often accompanied by other signs. Each poisonous substance tends to produce characteristic nervous symptoms. This is in contrast to the variability which occurs with some systemic diseases. Even so, it is not always possible to be certain simply from examination of a live or dead dog if the animal is suffering from infection or poisoning, and laboratory tests must then be made.

Lead is a cumulative poison in that small amounts taken in over a period are stored in the body and build up to a toxic level. The source of lead that has caused poisoning of dogs cannot always be traced, but it has been associated with dogs drinking water from the edge of paint pots, especially where the paint is soft, chewing painted objects or sticks used for stirring paint, feeding off an old, flaking painted surface, or licking old batteries.

Dieldrin has been suspected of causing deaths in many sheep dogs on New Zealand farms, and this is probably related to its widespread use. Dieldrin is one of a group of insecticides (including BHC, lindane, DDT, and aldrin) that produce very similar symptoms. These insecticides have been used mainly between September and April, which is the period when most dogs are poisoned by them.

Though most dogs are probably poisoned by swallowing these insecticides, there is a marked absorption through the skin from insecticide applied to the surface or hair. Poisoning has occurred through dog meat being sprayed or dusted to control flies; when dead sheep have been covered with insecticide to prevent dogs from eating them; when kennels have been washed out with dieldrin; through dogs drinking from dieldrin sheep dips; as a result of a dog being washed with a strong solution; and through putting dogs through the dip after sheep.

There is quite a marked variation in susceptibility of dogs to poisoning. Dieldrin, like lead and some other poisons, is stored in the body, and hence the danger is far greater with repeated exposure.

Arsenical poisoning probably occurs less frequently than it once did. Poisoning has resulted from access to sheep dips, foot baths, weedkillers, rabbit baits, dressed sheepskins, dressings for grain seeds, insect poisons, and sprays for fruit trees. Excessive doses of some older types of medicines may also cause poisoning.

Phosphorus poisoning is seen less frequently now owing to reduced use of phosphorus in rat and rabbit baits.

Strychnine baits or poisoned carcasses when eaten by dogs can cause rapid, violent deaths. This secondary poisoning of dogs permitted to feed on the meat of animals killed by any poisonous substance should always be borne in mind in pest destruction programmes.

Sodium fluoroacetate or 1080 is an extremely toxic and extremely efficient poison the use of which is likely to increase. It is tasteless and odourless. The poisoned animal dies quickly in a convulsive seizure and there is no known antidote. Secondary poisoning is a hazard with this substance. A rabbit poisoned with it has enough 1080 in it to kill a dog eating the carcass. Rats and mice poisoned with it may die outside their burrows and constitute a hazard if eaten.

Poisons Affecting Breathing

Among the poisons which cause difficult breathing are ANTU, warfarin, and the organic insecticides (parathion, malathion, and diazinon).

ANTU and warfarin are both sold under various trade names as rat poisons. Secondary poisoning of dogs may occur through their eating rats poisoned with ANTU. Warfarin poisoning is associated with repeated ingestion over a number of days, a single dose not usually being fatal.

Insecticides of the parathion, malathion, diazinon group have not yet been found in specimens from poisoned dogs sent to the Ruakura Diagnostic Station, but with increased use of these insecticides one must expect poisoning.

In cases of suspected poisoning it is advisable to obtain veterinary advice quickly

Internal Parasites

Six different species of tapeworms may infect New Zealand dogs, but they have little or no effect on the dog's health. Some are important, however, in that the intermediate stage cysts occur in livers and lungs of sheep, pigs, and men. The hydatid cyst is a well known example.

Of the worm parasites, hookworms can cause the most severe symptoms in dogs of all ages, and all dogs in the pack are infected if the parasite is present. Unthriftiness, lack of stamina, skin irritation, anaemia, and coughing may be seen.

Roundworms do not affect adult dogs, but the adult can carry them and infect young pups. In pups lack of stamina, unthriftiness, depraved appetite, pot belly, vomiting or passing of worms, and occasionally convulsions may occur.

Heavy infestation with whipworms may lead to chronic diarrhoea.

Control depends on treating all dogs in the pack for worms, cleaning kennels and exposing them to sunlight, and, if practicable, removing kennels to a new site.

Skin Complaints

There are a multitude of causes of eczema in dogs and these fall into one of several categories: parasites such as mange mites, ear mites, fleas, and lice; bacterial infections, notably common being staphylococcal abscesses; ringworms; allergic conditions; injuries; and irritant chemicals.

The effect on the dog varies a good deal, but it is important according to the irritant involved, the extent of infection, and what part of the dog is affected. Once a skin lesion is established it is likely to be aggravated by the dog itself, because the site is inclined to itch, the dog scratches, and this causes more skin damage, more itching, and more scratching. Treatment is designed to remove the cause and relieve the itching. One should always be careful of what materials are applied to the skin, because if a substance is irritant it can cause more trouble than it will cure.

Generally a well fed, healthy dog housed in clean surroundings does not suffer from skin complaints.

A common condition in farm dogs is a thickening and sloughing of the skin of the pads of the feet, which exposes large areas of tender tissue. This appears to arise from the sheer hard work the dog does with hard running and rapid turning over roads, tracks, and yards. This causes wear and tear and devitalisation of the skin of the pads, which allows secondary infection of the pads to occur.

Injuries

Injuries are an occupational hazard for dogs, but a little thought or restraint by the owner may prevent some. The causes are as varied as the type, extent, and seriousness of injury; some are: rips from wire or wild pigs, cut tendons from mowers during haymaking, broken bones or ruptured liver or diaphragmatic hernia from falls, kicks, or being struck by motor cars, and strangulation from being tied up on a moving vehicle from which the dog can jump off. Surgical treatment will be needed for these injuries.

Management

Farm dogs in New Zealand are generally fed meat or bought dog biscuits. Deficiencies of various elements of diet such as minerals and vitamins do not appear to occur in this country, except that unless a young dog receives a supplement of calcium in the form of milk it is likely to develop rickets.

On the other hand, there is a tendency for some owners to underfeed their dogs in the belief that if they are fed too well they will not work properly. The dog works hard for its one meal a day and expends a large amount of energy. It is not capable of working to capacity if it is not fed adequately. The regularly fed and well fed dog is less likely to go away to find extra food. There is a good deal of evidence that it is the underfed, poorly kept dog which is most often found to be poisoned.

There is no better protection for the dog's health than good housing. Many plans of kennels have been published recently; some are expensive, but a satisfactory building may be erected cheaply. Briefly, each dog should have his own compartment, which should consist of a small, warm, draught free wooden box and a larger, wire netting enclosed run. The floor of the box is made of flooring timber and that of the run of slats an inch apart. The whole structure should be supported about 2 ft above a concrete slab. This makes cleaning easy.

The dog likes to be reasonably clean in its habits. Dogs commonly suffer from chronic constipation, and a major cause is the tying up of the dog to a kennel for days on end, the dog refusing to defecate round its house. Provision of an adequate run helps to prevent this occurring. Kennels should be built in as warm, dry, and sunny a position as possible.

Commonwealth Economic Committee

Periodical Intelligence Services issued by the Committee are:

Wool Intelligence (monthly, including Fibres Supplement).

Intelligence Bulletin "Dairy Produce and Meat" (monthly with supplement "Weekly Dairy Produce Supplies").

Fruit Intelligence (monthly with supplement "Weekly Fruit Supplies").

Tobacco Intelligence (quarterly with supplement "Tobacco Bulletin appearing in intervening months).

Grain Bulletin (monthly, including Rice Supplement).

Tropical Products Quarterly (covering coffee, cocoa, spices, vegetable oils and oilseeds).

Hides and Skins Quarterly.

The subscription rate for Wool Intelligence is £2 per annum and for Tobacco Intelligence £1 10s. per annum. For Fruit Intelligence and the Intelligence Bulletin it is £4 10s. per annum each including the weekly supplements, or £3 per annum without the supplements. For the Grain Bulletin the subscription rate is £2 per annum including the Rice Supplement which can also be obtained separately for £1 per annum. For Tropical Products Quarterly or Hides and Skins Quarterly the subscription rate is £1 per annum. All rates are post free. These publications are available only from the Secretary, Commonwealth Economic Committee, Marlborough House, Pall Mall, London, S.W.1, England.

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By K. H. MARCUSSEN,
Horticulturist,
Department of Agriculture,
Christchurch

FLORISTS' anemones are derived from *Anemone coronaria*; they are available in mixed colours and in named selections of the varieties St. Brigid and De Caen. They can be obtained as single or double flowered.

There are a number of anemone species in cultivation; they are mainly associated with the rock garden, for which many species and varieties are available here, but some are also useful for the herbaceous or mixed border. The most widely used species in New Zealand is the tall growing *Anemone japonica*, which flowers in late summer and autumn and is available in a number of varieties in pink and red shades and in white.

The species are hardy perennials; most of them die down in autumn and come into growth the following spring.

Florists' anemones are treated as annuals. They are tuberous plants and are usually bought as one-year-old tubers and discarded after one season, though they can often be retained for another season in home gardens.

Among the double or semi-double flowered types (St. Brigids) there are generally some single flowered plants. They are superior for bedding, because the greater number of petals to each flower gives the impression of a more massed display. Some florists prefer them, but often the single flowered De Caens are chosen for their greater daintiness, though their flowers are larger when fully opened.

De Caen anemones are hardier and produce more flowers during winter, factors which should be considered by southern growers, who not infrequently find that climatic conditions are adverse to the health and productive capacity of their plants.

Naming of the various selections of St. Brigid and De Caen varieties is rather confusing. Dutch and Australian as well as New Zealand grown tubers are offered for sale and the names of the same kind often vary. In the following list the Australian names are added in brackets. The most popular for commercial flower production are:

St. Brigid

The Governor (Claremont Beacon), brilliant red.

Lord Lieutenant (Blue Admiral), rich blue.

The Admiral (Amethyst Beauty), rose violet.

Purity, white.

De Caen

Hollandia (Scarlet Emperor), bright red.

Mr Fokker (Blue Bonnet), blue.

Sylphide (Rose of Claremont), rose violet.

The Bride, creamy white.

Bella Flora Strain

This is an excellent mixture of single flowered, predominantly bright reds and dark blues.

White anemones are sought only occasionally and bruise easily; they should not be overdone in any planting.

Requirements

Anemone coronaria is a native of Mediterranean countries where it flowers in spring and early summer. After flowering, the foliage matures and dies down, while the tuber goes into dormancy until the weather cools down again in autumn, when root development and growth slowly commence.

As a florist crop it is valuable in winter when supply is less plentiful, particularly in red and blue colours. Flower production during winter is contrary to the nature of the plant.

Tubers grown from seed locally may not become sufficiently dormant when planted up soon after lifting. If they are late in ripening off, they are better stored a full year.

They can be stored for two or three years and develop quite satisfactorily if they have been properly dried after lifting and are kept dry in storage.

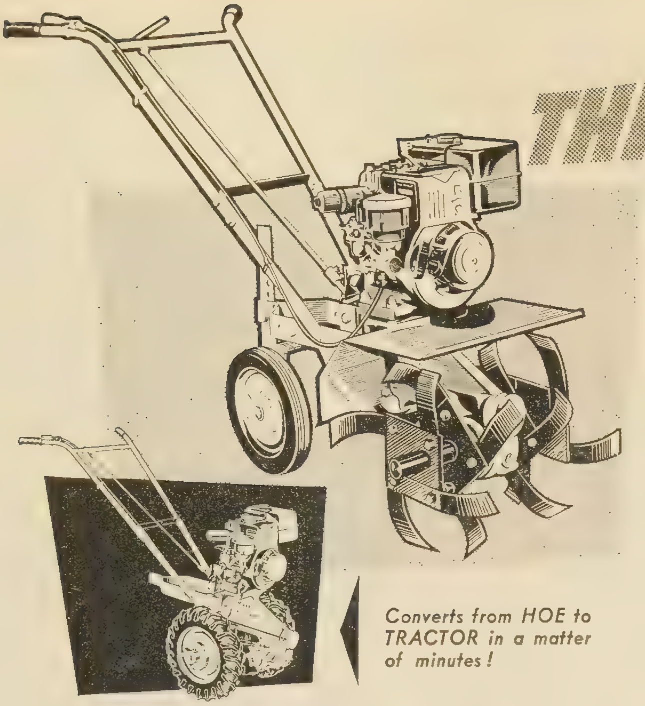
In New Zealand the corms start into growth in the hottest part of the year, and in many districts during very dry conditions. It is difficult to promote a good root system before flowering commences, which is a reason why early flowers appearing in March are inferior.

Strong winds, particularly if they are salt laden, are harmful to anemones and an exposed position should not be used for this crop. They do, however, require free air circulation to prevent development of fungous diseases. The ideal position is one with main shelter from the prevailing winds situated some distance away, and intermediate shelter in the form of hedge or trellis near the plot.

Soil Improvement

A deep rich loam with good water holding capacity and perfect drainage is required for anemones. The humus content must be high.

Strawy farmyard manure is the best way to improve the soil for this crop



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and this manure is used in the United Kingdom at 20 to 30 tons per acre. This appears to be excessive, but heavy applications of stable manure have proved well worth while and can be strongly recommended for most New Zealand conditions.

No other animal manures will equal strawy stable manure, as they do not add the bulk of organic material to the soil. Pulverised sheep manure with plenty of wool is useful on a small scale. Poultry manure might be used at 1 ton per acre if turned in with a good crop of grass.

Well made compost also has value and can be made up of stack bottom and poultry manure, preferably the deep litter type; sawdust and wood shavings can be incorporated to make up bulk. Spent mushroom compost, which is sometimes available, is a valuable addition to the compost heap.

All soil preparation for anemones should be done early so that the soil will be firm and fully consolidated before planting.

Animal manures should be applied and worked into the soil during the previous winter. Subsequent light cultivation will eradicate many weeds before planting and this will be of great benefit to the crop later.

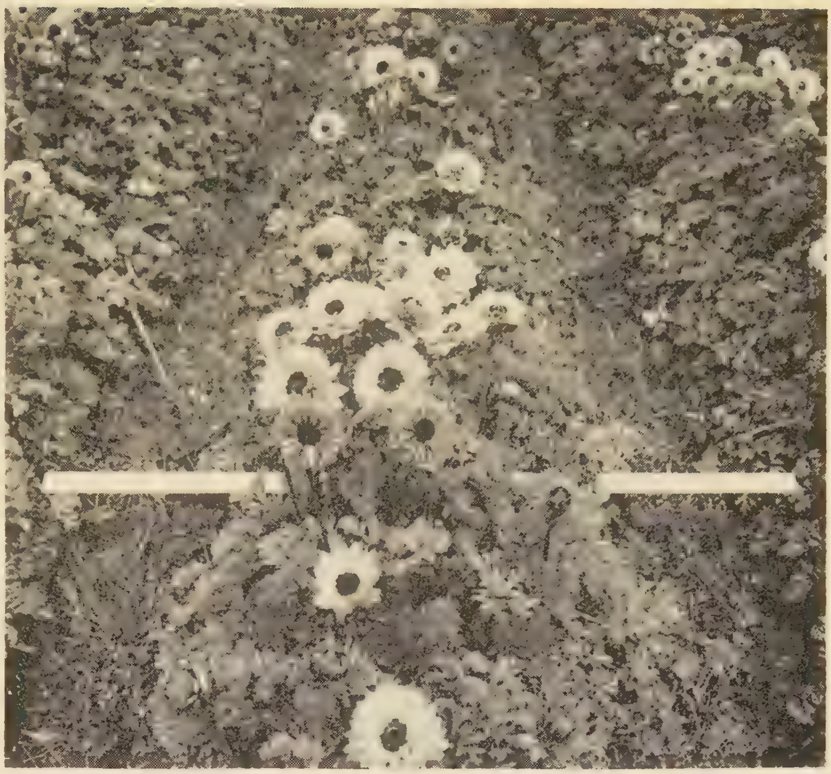
Liming

Anemones prefer a neutral to slightly alkaline soil; the pH should not be lower than 6.5. Lime, if it is given in the form of agricultural lime, should be applied the previous winter; hydrated lime can be applied later, but even that should be given well ahead of planting.

Fertilisers

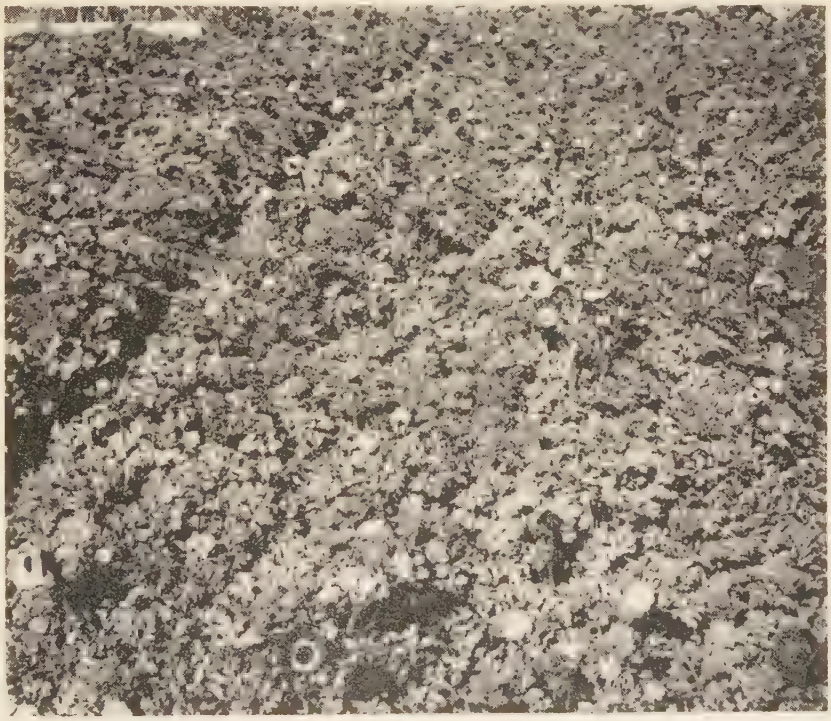
All the major elements should be available to the plants. Potash appears to be the most important, but must be given with nitrogen and phosphate. Quick acting nitrogen fertilisers are not suitable, particularly for the base dressing; their application will result in too lush foliage growth. There are also indications that excess nitrogen has a depressing effect on flowering.

Research, as well as practical experience, has shown that organic forms of nitrogen are the best for anemones. Hoof and horn is recommended overseas; this is seldom available in New Zealand, but other nitrogenous waste materials are obtainable. Wool trimmings from carpet manufacturing are, for example, a very good substitute. Supplementary nitrogen can be given in the form of dried blood in side dressings. Magnesium is also beneficial and if superphosphate is considered in the base dressing, serpentine superphosphate could be used, as it contains a small percentage of magnesium. In addition to supplying magnesium serpentine superphosphate has phosphate in a more readily available form, particularly for soils with high lime content.



▲ Row planting used in commercial flower production encourages healthy development of plants. The 3 ft ruler placed across the row shows the spread of the plants to be 24 in. Distance between rows is 30 in.

▼ Bed planting for commercial flower production prevents air movement between plants.



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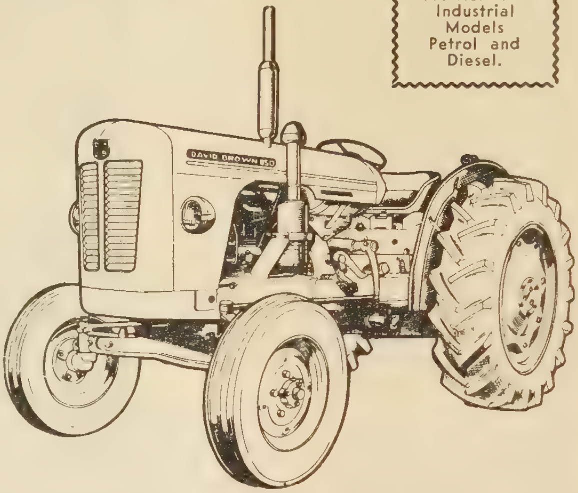

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Anemone tubers are measured by their circumference; these are fairly large, about 5 cm.

The base dressing of fertiliser should be applied 10 to 14 days before planting and worked in lightly.

There has been no research into anemone nutrition in this country, but work overseas suggests the following as a general base dressing per acre:

5 cwt of hoof and horn
5 cwt of bone flour
5 cwt of sulphate of potash

Side dressings of up to 1 cwt of dried blood may be given, according to the development of the crop.

If it is not possible to obtain hoof and horn, which contains approximately 13 per cent of nitrogen, other materials should be sought which will make nitrogen slowly available and they should be used at a rate which will bring them in line with the fertiliser value of hoof and horn.

The 5 cwt of hoof and horn and the 5 cwt of bone dust can, for example, be replaced by 10 cwt of meat meal, which contains about the same percentage of both nitrogen and phosphate. The nitrogen will, however, be available more quickly than from the hoof and horn and where adequate animal manure has been applied it may be advisable to cut down to 8 cwt of meat meal, make up the phosphate content with 1 cwt of serpentine superphosphate, and rely on side dressings with dried blood to give additional nitrogen supply later.

Layout and Planting

For garden display, anemones are often used with other plants, for example, ranunculus, and planting distance is based on the layout. If used on their own, 8 to 12 in. between plants should be the minimum, the greater distance being for early planting and when large tubers are used.

In commercial planting for cut flower production row planting has proved the most satisfactory, as plants have a spread of 24 in. if given sufficient space.

It is often said that it is necessary to grow anemones close together in beds to produce long stems. The flower stems become drawn when the foliage is a close mat over the bed, but the stems have not thickness or strength and are no longer than flowers from well grown plants in rows. Perhaps a greater factor against bed planting is the lack of ventilation in a bed, which results in slower drying of the foliage after rain and the damp conditions so prevalent in late autumn and early winter. Poor ventilation and the close contact of foliage create ideal conditions for both infection and spread of diseases. Weed control is much easier in row culture.

Single row planting is preferable. A distance of 30 in. between rows is necessary to facilitate walking without damage to the leaves.

Double rows spaced 24 in. apart alternating with 30 in. spacing can be used where land is at a premium, but management is more difficult than with single rows, which can be approached from both sides.

Planting distance within the rows can be 4 to 6 in., according to the size of the tubers to be planted, but 6 to 9 in. is better for the health and development of the plants.

Depth of planting should be about 2 in. and the "bud" faced upward. The soil must be firm for planting.

Ridging

Benefits of ridging up for the rows whether they are placed singly or double are:

1. Drainage is better and the soil is therefore kept warmer in winter, when maximum flower production is required. More irrigation is needed during summer, but the end result is worth it.

2. Ventilation within plants is better, as the leaves can spread over a larger area when they can droop down over the sides of the ridge.

3. The spacing between leaves is conducive to better pest and disease control.

4. It is easier to avoid damage to leaves by walking between the ridges.

5. Weed control is greatly simplified.

The ridges must be prepared well ahead of planting time to facilitate thorough consolidation. The tops can be flattened to a width of 4 to 5 in.

Size

Small to medium tubers planted early give the best plants and greatest flower production. Large tubers planted in midsummer produce too much foliage, which is liable to become damaged and encourage disease, but they are preferable for winter planting for a display required in spring.

For planting in December 2 to 3 cm tubers are satisfactory, but for January planting 3 to 4 cm tubers can be used, particularly after the middle of the month. These sizes indicate the circumference of the tuber which is the international standard.

Flowering and Marketing

Anemone flowers last well on the plant and as cut flowers. For continued flowering, seed setting should be prevented. Flowers should be removed when they start looking ragged. In commercial flower production, unmarketable flowers should be removed as soon as possible. Flowering begins in March/April and on a good crop which has been well cared for production continues until September/October.

For cut flowers, blooms must be almost mature when cut, but they should not be open when sent to the market. It is difficult to get them to the market in the right condition late in the season, but flowers that are not over mature close up if kept in a cool shed during the hours of darkness.

Full maturity has been reached when the anthers open up. "Green buds" do not colour up in water.

It is best to cut them either early or late in the day. Neither the leaves nor the young buds should be damaged.

It is preferable to cut the flowers rather than to break them off, but it is dangerous to cut in a crop infected with virus, as sap transmission on the knife blade can spread virus.

Flower growers in Holland use a special knife on which a film of disinfectant, such as 10 per cent trisodium phosphate (NA_3PO_4) runs over the blade when it is in use. Some of these knives (see sketch) are in use in New Zealand and have proved fully effective.

The flowers should be bunched either in the field or immediately on being brought into the packing shed. They should then be placed in water. They

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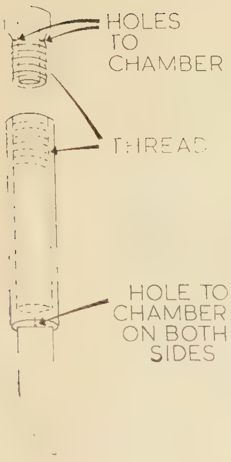


Virus protection knife. The hollow handle holds disinfectant which flows over the blade when the knife is held down after the stopper has been loosened.

are bunched in 12s and according to length of stem and grade of flower. Two rubber bands are used, the top one not being too high or the stems may become damaged.

Each bunch should be a separate colour. Various grades should be kept apart, but different coloured bunches can be mixed in the boxes.

The flowers should be kept in water for several hours at least; after that they travel well. The stems will elongate after they have been put in water. As this may happen in transit, they should not be packed too tightly.

Cropping under Glass

Anemones can be grown satisfactorily outside in the major flower growing areas and with a satisfactory return. A Christchurch grower shows a production of 19 blooms marketed during a season from every tuber planted.

The extra costs of growing anemones under glass therefore do not seem to be warranted, and the plants do not appear to be very satisfactory when grown under glass in New Zealand, except where it is possible to cover them with a well ventilated movable glasshouse in autumn when damp weather sets in.

Some heat, or forced air circulation, would be required to keep the plants free of botrytis, which usually takes a heavy toll of plants growing in a cold glasshouse or under cloches.

Raising from Seed

Though it is normal commercial practice to plant one-year-old tubers which have been imported or raised by specialist growers in New Zealand, it may prove very satisfactory for the bigger growers to raise their own from seed. Reasons for this are:

It is sometimes difficult to secure the tubers by the intended planting date and import control may make it difficult to obtain them in large enough quantities.

Brought in stock could carry some virus. This could have been transmitted to the plants late in the previous season without symptom development to facilitate roguing. When growers raise stock from seed this danger is reduced.

Seed should be collected on sunny days from selected plants. It should be kept in perforated paper bags in a warm position (60 degrees F) where humidity does not exceed 75 per cent. Under such conditions seed can be kept up to three years without much loss in germination.

It is preferable to sow in sterilised soil to prevent weeds in the seedbed, but otherwise the seedbed should be prepared as for a normal crop. Sowing should take place as soon as conditions are right; in September or October, according to locality.

A better and quicker germination takes place with "prepared seed". The "wool" should be removed by rubbing the seed in sand. It should then be mixed with sharp sand at a rate of 1 lb of seed to 10 lb of sand and kept moist and at a temperature of 70 degrees for 10 to 14 days.

Seed can be broadcast at about 4 oz to 45 sq. yds. of bed. The soil cover should not exceed ½ in. and must be firmed down. Prepared seed germinates in about a week.

The seedbed should be kept evenly moist, and shading with lath frames may be necessary in bright sunshine until the seedlings are well established.

Even if selection has been made when the seed was taken, it is necessary to rogue the seedlings as soon as flowering begins to ensure good planting stock for the next season.

The tops should be cut off the plants as soon as they mature in late spring. The tops of the beds with the tubers are then taken off and the soil sifted away. The tubers should not be left in the ground after removal of the tops. New roots may develop and if that happens, the germinating ability may be destroyed and the tubers become useless.

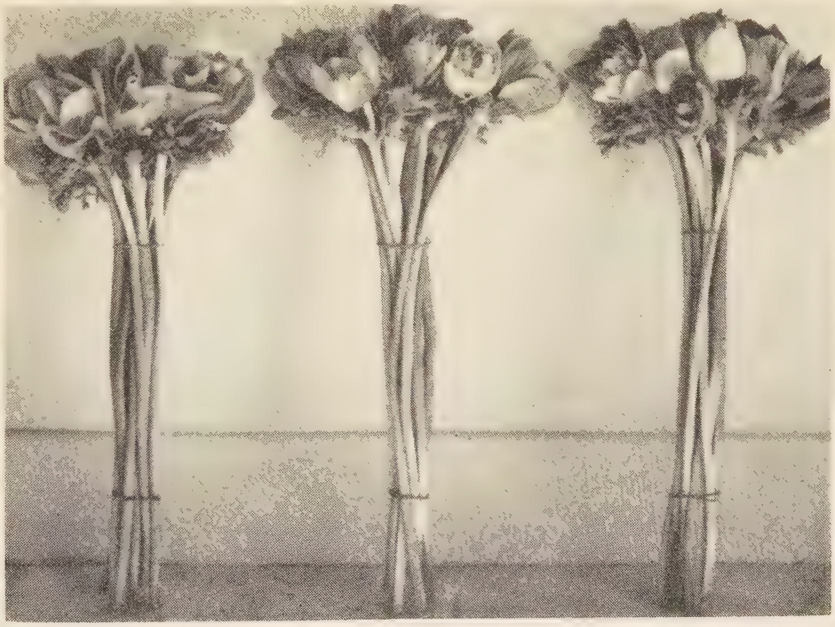
After lifting, the tubers must be dried for about a week in a warm, well ventilated position. They will shrink to about one-third their original size. The debris should be cleaned off and the tubers should be graded before they are stored in a dry, airy position.

Chemical Weed Control

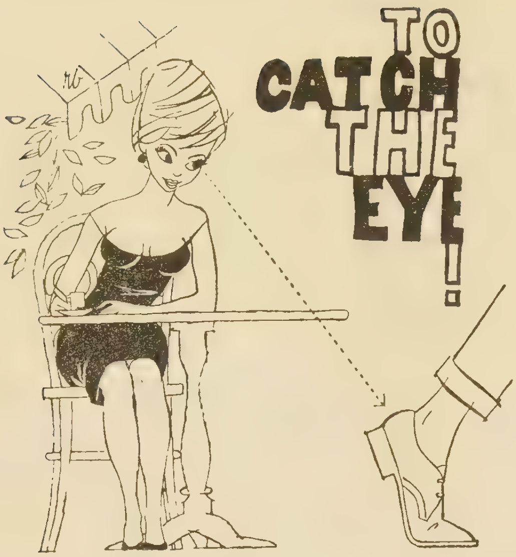
Weeds should not be tolerated in an anemone crop, not only because of competition with the upper roots of the plants, but also because of their smothering effect which prevents free passage of air among the leaves.

The land which is chosen should be free of perennial weeds and if the preparation for the crop is commenced early, many of the weed seeds in the upper soil layer will have germinated and have been killed before planting.

The best method, according to overseas reports, is the use of a flame thrower and this may be preferable to chemical weed control. Not only will the weeds and weed seeds near the surface be killed, but the burning



First-grade anemones bunched for marketing. Note position of rubber bands.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will kill any botrytis spores in the soil surface.

Though various chemicals have been tried for weed control on anemones overseas, none has been found which can be applied after the crop has emerged.

PCP at 4½ lb per acre has been used to kill weeds before emergence of the anemones and will have some lasting effect on germinating weeds. Anemones can, however, also be damaged, and PCP should not be applied closer than five days before the anemone leaves appear.

Diquat, which has recently been placed on the New Zealand market, will do a similar job. It should be safer, but is not persistent. It should be used according to the manufacturer's recommendations.

Vapam has been used by several growers in Canterbury and is valuable not only for its ability to kill weed seeds but also for its control of pathogens. It is a soil disinfectant. It should be applied at 1 quart to 100 sq. ft. diluted 1 part in 8 of water and forced down into the soil by heavy irrigation, at least 4 gallons per square yard. It is effective only to the depth it has penetrated and should be applied to the fully prepared ground. That is a disadvantage where ridge planting is carried out, but it is a practical proposition.

At least four weeks must be allowed between treatment and planting for the vapam fumes to escape. For preparation of seedbeds when temperatures are colder, several months must be given.

Mylone is similar in action to vapam, but has the advantage of being available in a granular form which can be worked into the topsoil. Heavy irrigation (1 to 2 in.) is required to dissolve the material and to allow it to penetrate the soil. It is a much easier material to handle than vapam, but unfortunately it is much more expensive. It should be applied at three-quarters of a pound per 100 ft.

The time lapse required before planting is similar to that after use of vapam.

Treatment with methyl bromide has been given by some growers, but cannot be recommended at present. There have been complications with some of the crops where the soil had been thus treated and it is possible that the fumigant was responsible.

Pests

Soil insects, particularly springtails or collembola, can sometimes cause trouble, mainly early in the season, by feeding on the tubers and the young leaves before they rise above the ground.

Vapam or mylone treatment should control all soil insects. The best alternative is aldrin at 1 pint of 20 per cent emulsion in 25 gallons of water to 1,000 sq. yds. applied pre-planting and worked into the soil.

Lindane 25 per cent wettable powder can be used after planting at ½ oz to 3 gallons of water applied liberally.

Aphids, or green flies, are a serious pest of anemones because they transmit cucumber mosaic virus. Protective sprays should be applied at least every three weeks.

Organic phosphorus sprays are very effective, but home gardeners should use lindane at the rate recommended by the manufacturers.

Thrips are the carriers of tomato spotted wilt, another virus often found on anemones. The treatment recommended for aphid control should be effective.

Diseases

Viruses are the most serious diseases of anemones, perhaps because they are seldom recognised as such. Several viruses are common on anemones in New Zealand, particularly cucumber mosaic virus and tomato spotted wilt virus. Their intensity varies according to the density of their vectors in any particular district. Both have a very extensive host range in cultivated plants as well as among weeds.

Plants infected with a virus disease cannot be cured and spread the disease. They should be rogued as soon as they are noticed.

Cucumber mosaic virus is spread by common aphids, but this virus can also readily be spread by mechanical sap transmission, for example, on the knife when flowers are being cut.

Symptoms of infection vary, but bronzing of the leaves, particularly in the early stages, and a dull yellow mottle are symptoms. Chlorosis can also develop and malformation of the leaves caused by irregular necrosis. The flower petals may be misshapen and are often split; colour breaking shows in finely pencilled lines of a paler shade or in white.

Tomato spotted wilt virus is spread by onion thrips (*Thrips tabaci*).

Infected plants show a pronounced distortion and curling of the leaves, a shortening of the petioles, and severe stunting.

Botrytis or grey mould is the most common fungous disease of anemones. During dull and moist conditions it will spread quickly from plant to plant, particularly if they are growing close together. The disease is easily recognised by spotting and browning of the petals, rotting of the buds, and by the light grey fluffy mould which frequently appears at the base of the plants.

The spores, which are plentiful everywhere, find entry through the softer tissues where damage has occurred and where stems and stalks have been broken off.

Control of the disease is primarily by avoiding conditions favouring its spread. Proper spacing of the plants and ridge planting to facilitate maximum air circulation between plants, careful handling of the crop so that no unnecessary damage occurs, and good hygiene will all help. Spraying at regular intervals with zineb 65 per cent wettable powder at 2 lb per 100 gallons, or thiram 80 per cent wettable powder at 1¼ lb per 100 gallons will also assist in prevention. As a routine it should be done at three weekly intervals, but weekly applications should be made during dull and damp weather.

Sclerotinia (*Sclerotinia sclerotiorum*) is sometimes encountered. It is mainly a soil borne disease which persists in the soil for many years. It affects many crops and is difficult to control. Some control can be obtained through application of PCNB. This is available in various strengths as a dust or wettable powder. A 20 per cent material should be used at 1 lb per 100 sq. ft. one week before planting and worked into the top 4 in. of soil.

Powdery mildew is sometimes found on anemones. It is usually seasonal and develops on plants which, due to their method of growing, would be subject to botrytis. It can be distinguished, however, by the mould being powdery and almost white, as against the grey fluffy mould of botrytis.

Primarily, control is similar to that of botrytis, but when the disease occurs the plants should be sprayed with karathane at ½ lb per 100 gallons or sulphur as a spray or dust.

Some of the organic sprays used for insect control are incompatible with both karathane and sulphur and they should not be applied while these materials remain on the plant or damage may result.

Rust may be found on anemones, but it is not common. It occurs as one stage of stone fruit rust, *Puccinia pruni-spinosae*, and is most likely to be found on plants growing near stone fruit trees, particularly peaches.

Zineb sprays as recommended for botrytis should give adequate protection.

What is thought to be rust on anemones is much more likely to be virus.

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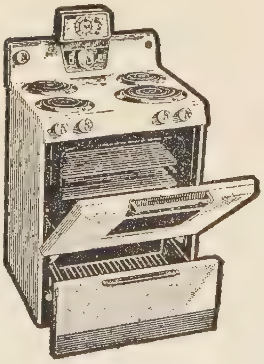

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Garden Work in January

After the holidays the garden will need extra attention if it is to continue growing and flowering well for the rest of the season.

Plunge the pot containing the Christmas tree up to its rim in soil in a cool, shady, sheltered position and water it well.

Remove dead heads from all flowering plants and trim back untidy plants if they encroach on paths or other plants.

Tie in the long new growths of climbers so that they cover their supports and are not broken or damaged. Prune new growths of wistaria to four to six buds from the base.

Mow lawns and trim the edges. During dry spells do not cut the grass very short unless it can be watered regularly.

Cut hedges, and compost the trimmings. Grass and hedge cuttings make good compost with untreated sawdust, and they rot quickly during warm weather. Water the heap if necessary.

Hoe wherever possible, and hand weed herbaceous plants and seedlings. When the ground is free of weeds it can be sprayed with diuron or simazine at 1 oz to 150 sq. yd. to prevent weed seeds from germinating.

Water in the evening during dry spells, giving priority to seedlings and to anything planted the previous winter or spring.

Side dressings of liquid manure or blood and bone watered in round dahlias, chrysanthemums, gerberas, carnations, and many herbaceous plants will encourage strong growth and flowering.

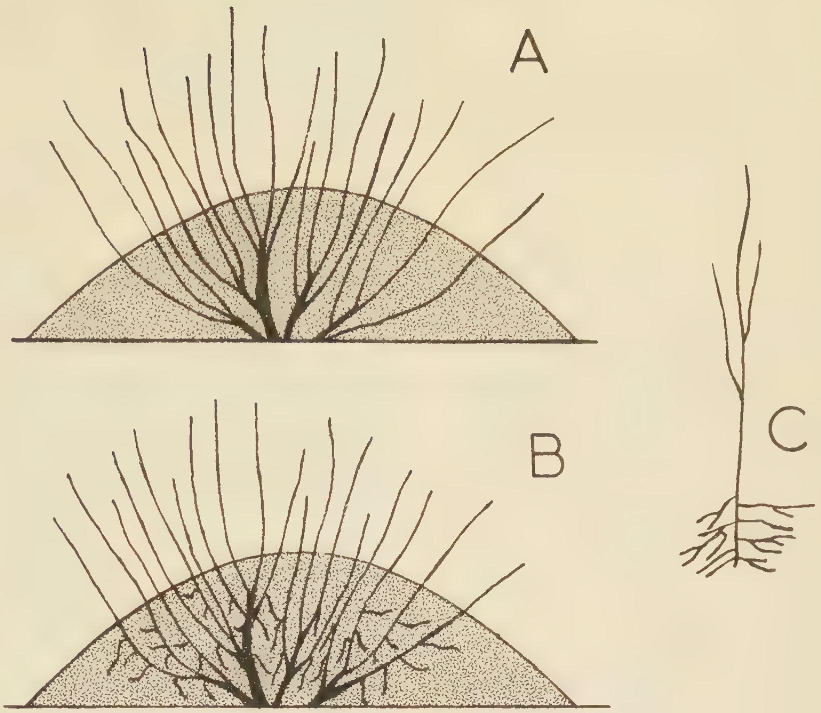
By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

Inspect all plants regularly for pests and diseases. Thrips, red spider mite, and aphids are all common this month and may be controlled with malathion wettable powder, 1 oz, or ½ oz of emulsion in 4 gallons of water at 10-day intervals. Aphids may often be discovered by the presence of ants on the plant. Thrips and red spider cause a silvering of the leaves, and are very common on gladiolus, fuchsia, and acmena. DDT emulsion at 1 fl. oz. in 4 gallons of water may be applied if only thrips are present.

Bulbs

Complete the lifting of spring flowering bulbs. Destroy any which are soft or obviously diseased. Store sound bulbs in a dry, airy shed. Old nylon stockings make useful storage containers for small quantities.

MOUND LAYERING



A—Any small shrub with many branches arising at or close to ground level is suitable for mound layering. Cover the base of these branches with good sandy soil, and water as necessary.

B—Roots grow out from the branches into the mound of soil.

C—When sufficiently rooted (six to 18 months) cut off each branch, after carefully removing the mound of soil, and plant out.

Some lilies (candidum, pyrenaicum, martagon, croceum, bulbiferum, monadelphum, and chalcedonicum) flower best if left undisturbed. If they must be transplanted, lift the bulbs as soon as possible after flowering and replant immediately. Choose a well drained semi-shaded position, between shrubs for example. If the bulb is large and healthy, a few scales may be taken from it and pushed into damp sand for propagation. Many lilies reproduce readily from seed. The seed should be allowed to ripen on the plant and then should be sown immediately in shallow drills in light sandy soil.

Prepare the beds for planting anemone and ranunculus this month. Anemones are fully dealt with in the main flower garden article on page 599. For ranunculus raise the level of beds a few inches on clay soils to improve drainage, as flowers are few and small if the soil remains very wet during winter. Lime heavily with agricultural lime if the soil is at all acid, as growth may be severely checked if the pH is below 6.0.

Organic matter is invaluable for these flowers, and animal manure or compost should be dug in when the ground is being prepared. Where it is easily available and cheap, peat should be rotary cultivated or forked into the soil when the bed is being prepared. Inorganic forms of nitrogen are not recommended, but a mixture of 6 parts of blood and bone, 1 part of superphosphate, and 2 parts of sulphate of potash may be forked into the topsoil at the rate of 4 oz to the square yard. Plant the corms two together, at least 9 to 12 in. apart as soon after midsummer as possible, so that the plants are well established with plenty of root and leaf growth by winter. Small corms are preferable for this early planting. If flowers develop too early, they can be picked off. Water the bed as necessary during hot, dry spells. The organic matter will help to hold the moisture in the soil and keep the roots cool.

Weeds can quickly smother beds of ranunculus and anemones, and reduce both the quality and quantity of the flowers. Growth and flowering are also severely checked if corms are disturbed, so weeds must always be removed before they have developed large root systems.

Make a further sowing of Iceland poppy and pansy. When the seedlings are large enough to handle, plant them out singly a few inches apart in a well prepared nursery bed in a semi-shaded position, and keep well watered.

Shrubs

Shrubs which are growing unevenly may be shaped during summer by removing any over-vigorous branch or cutting it back to a lateral. Branching of shrubs which tend to become leggy may be encouraged by pinching out the tips of vigorous shoots. Suitable tips 3 to 4 in. long may be used as soft-wood cuttings by inserting them in a sandy mixture, watering in, and covering with a frame or plastic bag.

Low-growing shrubs may be propagated also by mound layering. Such shrubs as erica, thyme, coleonema, diosma, and rosemary may be rooted by covering the base of the branches with a mound of a good rooting mixture (equal parts of sand, peat, and soil, with a sprinkling of bone meal). Water as necessary, so that some layers will be sufficiently rooted to sever from the parent plant next winter.

Sow seeds of kowhai and red kowhai before they are fully ripe (when the pods are still green). This is the general rule for most subtropical plants.

Continue budding roses as budwood becomes available. Propagate only from healthy stock.

Roses which were summer pruned in December may now be given a dressing of fertiliser (2 oz to the square yard of blood and bone) and thorough watering to start them into growth again for the autumn flush of blooms.

Glasshouse and House Plants

Keep the glasshouse as cool as possible by ventilating and spraying over with clear water early in the day. Renew the lime wash shading, if this becomes thin through heavy rain.

Watch for aphids, scales, and mealy bug, and control them as soon as they are noticed, as they multiply rapidly at this time of year. Controls are as follows:

Scales: Summer oil 8 fl. oz. in 4 gallons of water.

Mealy bug: DDT 50 per cent wettable powder, ½ oz in 4 gallons, or dab colonies with a paint brush or cotton wool dipped in methylated spirit.

Aphids: Lindane 25 per cent wettable powder, ¾ oz, or malathion wettable powder, 1 oz in 4 gallons of water, or use lindane smoke bombs.

A *Lilium auratum* hybrid 'Lavender Lady Trixie'. If it is necessary to remove lilies, transplant them immediately after flowering.

Thrips and red spider mite: Malathion wettable powder, 1 oz in 4 gallons of water.

Plant leaves are sometimes scorched by some insecticides (for example, kalanchoe by DDT sprays and ivies by oil sprays), and as the range of house plants is now so great, it is advisable to treat the individual leaf or shoot wherever possible rather than to spray indiscriminately.

Remove or cover house plants before using any type of fly spray, as the oil content of the spray produces brown spots on leaves.

Pot up cyclamen seedlings, using a sandy, well drained, open type of potting mixture. Cyclamen are successful in the shallow type of pot, and an attractive effect can be achieved by placing three plants in a shallow bowl or pan, such as a bulb bowl. (Drainage holes are essential.)

Leaf and stem cuttings may still be taken.

Pot up well rooted cuttings into small pots. Cuttings which have been rooted in sand must be moved into soil at an early stage unless they can be given feeds of very dilute liquid manure. Those rooted in water often die when transferred to soil, so introduce sand or soil to the water when roots first appear, to avoid any check to growth. As the rooted cuttings fill the small pots with roots, transfer them to a larger pot. Growth is considerably better than if the rooted cuttings are placed directly into a large pot.

Plants in a shade house become dry if they are exposed to drying winds; it is an advantage to line the house with glass or polythene for a height of 2 to 3 ft from the base. This excludes draughts and maintains humidity.

Floral Decoration

Flowers may readily be dried this month. Pick them when they are at their best, remove all leaves, and tie in small bunches before hanging them in a dark airy place to dry. Yarrow, statice, eryngium, bells of Ireland, echinops, golden rod, hares tail and shivering grasses, and the various straw flowers—helichrysum, rhodanthe, gnaphalium, and gomphrena—all dry well. Some which also dry fairly successfully are delphinium and larkspur, salvia species, gypsophila, and French marigold.

Preserve fully grown leaves of canna, hosta, beech, etc., with glycerine. Cut single large leaves, or sprays of leaves, and place the cut end immediately in a mixture of 1 part of glycerine in 2 parts of water. The glycerine should be dissolved in hot water and then diluted with cold. Any woody stems should be slit at the base to facilitate entry of the liquid. Remove the leaves from the glycerine as soon as they are sufficiently dark in colour.

When cutting dead flower heads, a few may be left on vigorous plants to develop into seed heads for cutting and use later on.

Driftwood, shells, and coloured pebbles are useful accessories for plants which are commonly associated with water, such as sea holly, statice, sprays of pohutukawa and tamarisk, iris, fairy bamboo, and grasses.

Rock pools may be suggested in the miniature beach scene by the use of polythene filled with sea water in which delicate seaweeds float. The edges of the polythene may be hidden by rocks and shells and the base covered with sand.

An entirely different style of decoration may be made from cacti and succulents. This is most suitable for summer arrangements, as they last well with the minimum attention. Plants growing in a decorative bowl or shallow pan make an attractive cactus garden. More variation is possible if the individual plants are grown in pots which can be sunk to their rims in sand in a suitable decorative container. The rims are easily hidden by sand or pebbles and the arrangement can be varied from time to time.

Rosettes of succulent plants may also be used effectively alone or in combination with dried material.

Traditional Dishes for New Year

NEW Year is the most ancient of all festivals and around it are centred traditions and customs dating back to primitive man. Though the implication is not always obvious, most present-day observances are symbolic of ancient beliefs and rituals. Much of this symbolism can be learnt from New Year observance in Scotland, where until at least the early years of this century old beliefs and superstitions had been faithfully followed through the centuries. A number of the recipes* that follow are accordingly of Scottish origin.

By MAUD B. STRAIN,
Home Science Instructor,
Department of Agriculture,
Dunedin

Roast Turkey

PREPARE the turkey, stuff the crop and body cavity, but do not pack the stuffing tightly, because it swells in cooking, and sew up or secure with skewers and string. Cover the breast with slices of fat bacon. Allow 20 to 25 minutes' roasting time for each pound of dressed weight. Cook at 300 to 325 degrees F, basting it frequently and turning it two or three times while it is cooking.

Half an hour before the roasting is finished remove the bacon from the breast and put sausages in the pan. Make giblet gravy. Remove skewers or thread before serving.

Serve with bread sauce, chipolata sausages, and bacon.

Giblet Gravy

- A small onion
- Tablespoon of dripping
- Sprig of thyme and parsley
- Half teaspoon of salt
- Pepper to taste
- Giblets
- Pint of water or stock

Peel and slice the onion. Brown it in the melted dripping.

Add the prepared giblets, salt, thyme, and parsley, pepper, and stock and simmer gently for an hour.

Take out the liver, wash it well, and return it to the saucepan to simmer for a few minutes longer.

Strain the liquid and use it to make a thick brown gravy.

Chestnut Stuffing (For Breast)

- Pound of chestnuts
- Half pint of milk or stock
- Two ounces of ham or bacon (optional)
- Three to four ounces of breadcrumbs
- Teaspoon of chopped parsley
- Ounce of butter
- Little grated lemon rind
- Salt, pepper, and sugar to taste
- An egg

Make a slit in both ends of the nuts to facilitate the removal of the skins and boil in water 10 minutes.

HEADING PHOTOGRAPH: The pleasant superstition still survives that whoever eats a mince pie each day from Christmas to Twelfth Night will have 12 happy months.

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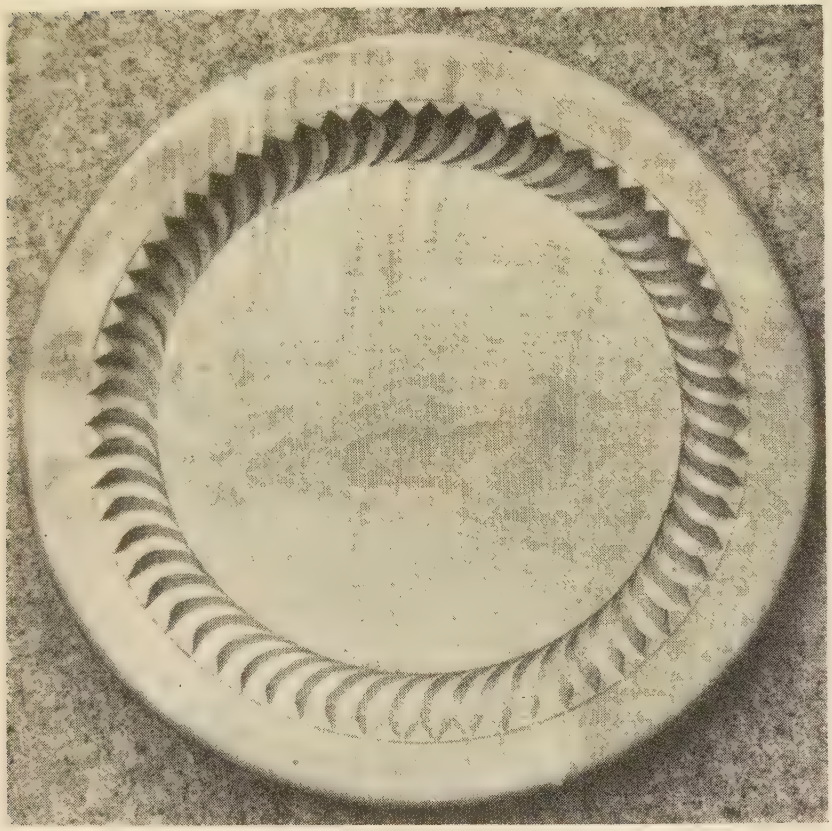
* Standard measuring cup (8 fl. oz.) and standard measuring spoons are used throughout these recipes. All measurements are level.



[*Hurst and Palmer*

A carved wooden mould such as this is used to give the traditional fluting to the large round cakes of shortbread.

Skin nuts and put in a pot with enough milk to cover. Simmer until tender.

Mash or sieve and pound with finely chopped ham or bacon. Add crumbs, parsley, lemon rind, and butter.

Season with salt, pepper, and sugar. Bind with beaten egg.

Herb Stuffing (For Crop)

Two ounces of finely chopped suet
Dessertspoon of dried thyme
Teaspoon of salt
Half teaspoon of nutmeg
Six ounces of fresh breadcrumbs
Grated rind of a lemon
Pinch of pepper
Egg yolk, wine, or stock

Mix suet and crumbs.

Mix in other ingredients and bind with egg yolk, wine, or stock.

Bread Sauce

Cup of breadcubes (crust removed)
Half small onion (grated)
Two whole cloves
Salt and pepper to taste
Cup of milk

Place the breadcubes in a saucepan. Add the grated onion and the cloves. Season.

Add the milk and cook gently 5 to 8 minutes, stirring carefully to prevent burning and adding more milk if necessary, but do not allow the sauce to become too wet.

Remove the cloves and add a little finely chopped parsley if desired.

Turkey Patties

Cup and a half of diced cooked turkey
Two tablespoons of chopped fried mushrooms (or sliced tinned ones)
Three tablespoons of butter
Two tablespoons of flour
Salt, pepper, and celery salt to taste
Three tablespoons of sherry (optional)
Cup of milk

Melt the butter in the upper part of a double boiler, stir in the flour, and when frothy draw the pan to the side and gradually stir in the milk. Season to taste.

Add the turkey and stir over heat until boiling. Add the mushrooms and sherry, stirring constantly. Pile into hot patty cases or on croutes of fried bread or buttered toast and serve very hot.

Haggis

This is a Scottish national dish and is not peculiar to a particular festival; it is appropriate for any Scottish celebration, including New Year.

Paunch and pluck of a sheep
Two teacups of oatmeal lightly toasted in the oven
Pint of pluck stock
Half pound of suet grated
Pound of onions
Salt, pepper, to taste
Juice of a lemon

Wash the paunch thoroughly in several cold waters. Turn it inside out and wash and scrape it in very hot water. Leave it overnight, steeping in cold, salted water.

Wash the pluck thoroughly. Use only a quarter of the liver. Place in a pan. Cover with boiling water, add salt, and boil 2 hours. Remove from pan and when cold cut away windpipe and trim off all skin and black-looking parts.

Grate liver. Mince heart, etc. Add these, with the suet and onions (finely chopped and parboiled) to the oatmeal.

Season and add stock to make the consistency of a very thick stew.

Half to three-quarters fill the paunch (to allow room for expansion), add lemon juice, press out the air, and sew up the bag.

Place it in a pan of gently boiling water, pricking it well to prevent bursting. (As a further safeguard against bursting, the haggis may be enclosed in a cloth of the same shape.)

Boil 3 hours.

Remove from the water and hang up to cool.

To Reheat

Put the haggis into a pan of warm water and heat very slowly so that it has time to heat through. **It must not boil** or it will burst.

Brandy Butter

Two ounces of butter
Three ounces of icing sugar
Two tablespoons of brandy

Cream together butter and sugar and gradually beat in the brandy. Pile mixture into a silver dish and leave in a cool place.

Sprinkle with more icing sugar just before serving.

Mincemeat

Pound and a half of cooking apples
Pound of suet
Half pound of seedless raisins
Quarter pound of mixed peel
Pound of currants
Pound of sultanas
Half pound of blanched almonds
Three-quarters of pound of moist brown or demerara sugar
Rind of two lemons
Rind and juice of an orange
Teaspoon of ground ginger
Teaspoon of cinnamon
Teaspoon of nutmeg
Quarter pint of brandy
Quarter pint of rum

Peel and core apples and clean and chop suet.

Clean the fruit.

Put the apples, suet, peel, fruits, and almonds through the mincer. Add remaining ingredients and mix thoroughly.

Cover and allow to stand for 2 days, then pack into clean, dry jars and cover until required.

Mince Pies

Any good pastry can be used, but puff is perhaps more traditional.

For puff pastry roll ¼ in. thick and cut circles 3 in. in diameter. Cut an equal number of rounds (to fit the top of a patty tin) for lids.

Line patty tins with the 3 in. rounds, fill with mincemeat, and moisten the edges with white of egg. Lay the lids on top and press the edges together. Make a small hole in the top of each pie, brush over with white of egg, and dredge with castor sugar.

Bake in a hot oven (450 degrees F) about 20 minutes or until pies are well risen and nicely browned.

Scots Shortbread

Four ounces of castor sugar
Eight ounces of butter
Eight ounces of plain flour
Four ounces of rice flour or
12 ounces of plain flour

Cream the butter and sugar thoroughly. Gradually mix in the flour and knead only sufficiently to blend.

The less kneading the more short and crisp is the shortbread. Do not roll it out (as rolling has a tendency to toughen), but press with the hand into two round cakes either in oiled or floured shortbread moulds or on a sheet of greaseproof paper. The most satisfactory thickness is ¾ in. for a cake 8 in. in diameter; this proportion should be kept for other sizes of cake.

The edges of a large, thick cake should be protected with a band of paper, and several layers of paper should be placed underneath it and possibly one on top.

Pinch the edges of each round cake neatly all round with the finger and thumb and prick it all over with a fork. Decorate with blanched almonds and strips of citron or orange peel. Put into a fairly hot oven (375 degrees F), turn the heat low, and allow the shortbread to crisp off to a light golden brown in about 25 to 30 minutes.

Gingerbread Men

Four ounces of butter
Four ounces of sugar
Nine ounces of flour
Half teaspoon of bicarbonate of soda
One to two teaspoons of ground ginger
Warmed golden syrup
White glace icing
Currants

Cream butter and sugar until very soft. Work in the sifted dry ingredients and mix with a little warmed syrup to a stiff workable dough.

Knead and roll out on to a floured board and cut out, using either a special cutter or a cardboard mounted pattern and a sharp pointed knife. Put the figures on to a greased tray and mark the eyes and buttons with currants.

Oatcakes and shortbread—as Scottish as the heather in the glens.

Bake at 350 degrees F for 10 to 15 minutes and allow to cool slightly on the tray before shifting to the wire rack.

When cold, decorate as required with white glace icing.

Scotch or Black Bun

Crust

Eight ounces of butter
12 ounces of flour
Water to mix
Teaspoon of cream of tartar
Half teaspoon of bicarbonate of soda

Sift dry ingredients together. Cut in the butter until the mixture has consistency of coarse crumbs. Add water to mix.

Roll out to almost ¼ in. thickness.

For the bun a cake tin with a loose base is desirable. For the top cut one piece of pastry the same size as the base of the tin. Re-roll and use the remainder to line the tin.

Centre Mixture

Pound of raisins
Pound of currants
Four ounces of chopped peel
Two ounces of almonds (blanched and chopped)
Dessertspoon of spice
Dessertspoon of cinnamon
Cup of flour
Quarter teaspoon of cayenne pepper
Half teaspoon of ground ginger
Half teaspoon of ground cloves
Teaspoon of grated nutmeg
Four ounces of butter
Two ounces of sugar
Three eggs

Cream butter and sugar. Add beaten eggs one at a time. Sift in the thoroughly mixed dry ingredients. Lastly add the prepared fruit and almonds.

Fill the crust. Put the top on, sealing with egg or milk, and prick the top well.

Bake slowly for 3 hours (electric 275 degrees F, coal 300 degrees F, dropping to 250 degrees F).

Oatcakes

Half pound of oatmeal
Quarter pound of flour
Teaspoon of salt
Teaspoon of sugar
Three ounces of butter
Warm water to mix

Mix the dry ingredients together in a bowl. Melt the fat. Mix to a stiff dough with a little warm water. Sprinkle oatmeal on the board. Turn out the dough on to this and knead lightly.

Roll out to a ¼ in. thickness. Cut into shapes.

Place on a greased baking sheet and bake in a moderate oven (375 degrees F) for 8 to 10 minutes.

Syllabub

Pint of thick cream
Pint of Chablis, brandy, or whisky
Nutmeg
A lemon
Sugar to taste
Walnut halves

Whip the cream. Add the grated rind and juice of the lemon and the wine or spirits.

Whip all the ingredients together, sweeten to taste, and pour into a large glass or crystal bowl or individual short-stemmed glasses.

Sprinkle with nutmeg and decorate with halved walnuts.

Lamb's Wool (Modern Version)

Six cloves
Half nutmeg (grated)
Two pieces of root ginger
Three sticks of cinnamon
Half tablespoon of coriander seeds
Half pint of water
Four bottles of Madeira wine
Pound and a half of pounded loaf sugar
Eight eggs
24 roasted crab apples

Simmer the first six ingredients until a good extraction of flavours results. Strain and add the liquid and the sugar to the wine in a clean, bright saucepan and warm gently to dissolve the sugar. Whisk up the eggs and stir briskly into the warm wine. Heat the mixture gradually while whisking until a good froth is obtained. Add the crab apples and let stand for 2 to 3 hours before serving.

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